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DISSERTATION ABSTRACTS

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MONOGRAPHS IN MICROFORM*

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AGRICULTURE

AGRICULTURE, GENERAL

A STUDY OF MATURITY INDICES FOR HALEHAVEN PEACHES

(L. C. Card No. Mic 60-722)

Surinder Singh Attri, Ph.D.
The Ohio State University, 1959

This investigation was designed to compare the suitability of various tests or indices when applied to eight daily stages of maturation of Halehaven peaches and to ascertain the extent of changes in the physical and chemical composition of the fruit during the last stages of maturation on the tree and during ripening under two different storage conditions.

Changes between the daily stages of maturation were measured by sixteen indices. The values for freshly picked peaches were determined along with those for similar samples kept in storage for various periods of time and under two conditions.

The characteristic feature of the following indices was a rise in values with maturation and during ripening in storage: color values obtained by using the USDA Color Chart and Upshall's Peach Chart, Gardner-Hunter "a" and "a/b" values and the soluble solids/acids ratio. The characteristic feature of the following indices was a decline in values with maturation and during ripening in storage: titratable acidity percentage, resistance to the Durometer and the Magness-Taylor pressure testers, Gardner-Hunter "Rd" and "b" values and chlorophyll content.

In contrast, the soluble solids percentage and pH declined at first and then rose till maturity at harvest, while in storage both increased in value. Carotene content increased slightly in the successive stages of maturation, but in storage no change occurred. The behavior of the index number was unexplainable during the maturation and ripening (storage) phases.

Despite yearly variations, certain indices afforded a reliable guide to the interpretation of the stages of maturation of peaches: firmness values with the Magness-Taylor and Durometer pressure testers, soluble solids/acids ratio, titratable acidity percentage, Gardner-Hunter "a," "a/b," "Rd," and "b" values, and the Gardner-Hunter color diagram. Upshall's Peach Chart and the USDA Color Chart were only fair indices of peach maturation, with the former a slightly superior subjective test. The indices whose use did not accurately indicate peach maturation stages were soluble solids percentage, hydrogen ion concentration, chlorophyll content, carotene content, and index number.

A correction had to be made for yearly variation, and correlations were therefore made on a within-year basis. The values of the USDA Color Chart, Upshall's Peach Chart, Gardner-Hunter "a/b" and soluble solids percentage, and titratable acidity percentage showed a marked

positive correlation with the Magness-Taylor pressure tester values.

Certain indices suggested were the ratios of firmness values determined by the Magness-Taylor pressure tester and the Durometer to the color chart values and Gardner-Hunter "a/b" and "a" values. The ratios of titratable acidity percentages to the color chart values and Gardner-Hunter "a/b" and "a" values were also suggested as possible indices. The use of these ratios and their reciprocals as indices should be investigated.

Microfilm \$2.50; Xerox \$6.00. 122 pages.

MULCH INFLUENCE ON SOIL TEMPERATURE AND CORN GROWTH

(L. C. Card No. Mic 60-569)

William Chapel Burrows, Ph.D.
Iowa State University of Science and Technology, 1959

Supervisor: Dr. Don Kirkham

The agronomic practice of mulching is considered to be a good soil and water conservation practice. Mulches protect the soil surface from the dispersing action of rainfall, slow down or prevent runoff and decrease evaporation. Acceptance of the practice of mulching or mulch tillage by farmers in the Corn Belt has been slow because yields are generally not as high with mulch tillage as with turn-plow tillage.

Previous work has shown that the lower soil temperature under mulch may be the cause of the poorer growth and yields of corn under mulch tillage. A study was initiated to (1) ascertain if the effects of soil temperature as induced by mulch are early season effects or if the plants are affected during the whole growing season; (2) investigate the effects of the rate of application of mulch; and (3) see if theoretical heat flow studies could be applied to tillage studies to give a better understanding of the effects of tillage on plant growth.

Two field experiments were carried out. One experiment had treatments where the soil was bare or mulched, soil temperatures were normal or increased by artificial heating; the heating was for the whole season or only the early part of the season. It was found that heating the soil decreased the time required for emergence and for maturity of the corn. Nitrogen uptake by the plants was decreased by mulching and was not affected by heating. Plant height and dry matter production were related to the average soil temperature in the treatments. The higher the temperature, the greater the growth. No benefits were evident from heating the soil all season as compared with heating only during the early part of the season.

The other experiment had as treatments rates of application of plant residues for mulch. The rates were

0, 1, 2, 4 and 8 tons per acre. Average soil temperature at three depths, 0.25, 2 and 4 inches, was highest in the bare soil and decreased with each added increment of mulching material. Plant height, dry matter production and growth rate were decreased by increasing rates of mulch.

In both of the experiments with regard to yields, beneficial moisture effects of mulch late in the growing season appeared to overshadow detrimental temperature effects of mulch in the early season. There was no apparent relation of yield to soil temperature.

Comparison of the soil temperature data with heat flow theory showed that the theory can be used to make qualitative predictions of some of the relationships of mulch and soil temperature.

The decreased soil temperature caused by mulching seems to be the cause of decreased corn growth in mulch. The effects of low soil temperature on the corn plant are early-season effects which may produce a physiological change in the plant which is carried over to the end of the season, but which may be overshadowed by soil moisture effects. Microfilm \$2.50; Xerox \$6.00. 123 pages.

FARM SIZE AND COSTS IN RELATION TO FARM MACHINERY TECHNOLOGY

(L. C. Card No. Mic 60-578)

Ronald Dean Krenz, Ph.D.

Iowa State University of Science and Technology, 1959

Supervisor: Earl O. Heady

This study was an attempt to estimate the effects of recent machinery innovations, such as four- and six-row corn equipment, on per unit costs of crop production. The study was based on the Carrington-Clyde soils in north-east Iowa and the Ida-Monona soils in western Iowa.

Cost functions were estimated with a synthetic or budgeting approach which consisted of constructing estimates of total cost and total product at various acreages from basic input and product data. Losses in crop production resulting from untimely field operations were included. Parametric linear programming methods were introduced to permit consideration of livestock enterprises and subjective discounting of returns. Criteria for decision making under risk and uncertainty were employed in a consideration of effects of variations in weather on per unit costs of production and optimal machinery-land relationships.

The results based on average weather and current cropping methods indicate that only small per unit cost advantages can be expected with the use of six-row cropping equipment or field corn shellers. Expanding operations from 200 crop acres and two-row equipment to 400 crop acres and four-row equipment will probably reduce costs per dollar product by six cents. Further expansion to the use of six-row equipment on 600 crop acres would further reduce costs by only 1.5 cents per dollar product.

Under cash-crop arrangements and current rotations, minimum per unit production costs would be attained at approximately 600 to 680 crop acres but with only small differences in per unit costs between 400 and 800 crop

acres. With a continuous-corn rotation, minimum per unit costs are attained at 320 crop acres.

Under livestock-crop arrangements, profits are maximized with 480 to 560 crop acres and 90 to 115 head of yearling feeders. The analysis of livestock-crop relationships indicates that a farmer with 160 crop acres should invest \$8-10,000 in hogs and feeder cattle before increasing land investments.

A consideration of the yearly variation in days suitable for field operations indicated that analysis based on average weather underestimates long-run per unit production costs. Decreased per unit costs in favorable weather are outweighed by extreme crop losses in years of unfavorable weather. Hence optimal machinery investment per acre is higher than considered necessary for years of average weather. The use of field corn shellers, not found to be profitable with less than 800 crop acres with average weather, may prove profitable on farms with at least 450 crop acres when variations in weather are considered.

Microfilm \$2.50; Xerox \$8.00. 174 pages.

PROCEDURES FOR IMPROVING THE USE OF PUBLICATIONS IN THE COMMUNICATIONS PROCESS BY PROFESSIONAL LEADERS IN AGRICULTURAL EDUCATION

(L. C. Card No. Mic 60-776)

Howard Leland Miller, Ph.D.

The Ohio State University, 1959

One of the major problems confronting leaders in rural education is keeping abreast of changes in agricultural technology and integrating these changes into local educational programs. The teacher of vocational agriculture and the county extension agent represent "general practitioners" who serve as information relay stations in a two-step communications process from agricultural research to the student or farmer.

Public-supported programs in agricultural research and education have become institutionalized in the agricultural experiment stations, the Cooperative Extension Service, agencies of the United States Department of Agriculture, and vocational agriculture training provided by rural schools. Publications have become one of the important vehicles for conveying information from the source to an ultimate audience. The prodigious amount of available information flowing through a multiplicity of channels poses a near-dilemma for the local educational leader.

The purpose of the study was to identify selected aspects of this problem in communications and develop procedures for more effective distribution and use of publications in educational programs. Specific problems centered in the educator's awareness of available information, procurement of publications, and indexing and filing references for future use.

The study data showed that teachers and extension workers received an average of more than three thousand publications a year, and maintained reference files ranging from fewer than two hundred to more than five thousand titles. A sample of 183 teachers and agents in 18 states rated publications as their most important single source

of information. Releases of state Extension Services, experiment stations, and the United States Department of Agriculture were rated as the most useful publications.

A comparison of information services of state and federal agencies revealed that more than nineteen thousand titles in agricultural subjects were available on current lists of publications of state experiment stations and Extension Services. Nearly five thousand additional titles were available from the United States Department of Agriculture. Both teachers and agents were generally better informed about state publications than about those of federal agencies. Extension workers, in the main, had well-defined policies for securing publications, but many were not following these suggested procedures. Teachers were less aware of available publications, normally had fewer copies as references, and reported more diverse methods of obtaining publications.

Despite the great number of publications received by field workers and the imposing amount of available information in agriculture, many leaders felt their information was inadequate for conducting satisfactory educational programs. The study suggested procedures for improving awareness to publications and to methods of procuring informative materials.

Recommendations included suggestions for a well-standardized and widespread announcement of publications, revised methods of expediting distribution, freer exchange of publications between states and agencies, and the adoption of programs for planning publication needs for the teacher or extension worker.

The final recommendation was for the adoption of a national indexing system for technical agricultural publications by which all releases could be classified for filing at the time of printing. To provide for such a plan, a suggested uniform index for agricultural subjects, applicable to the entire United States, was developed and published under the name "AGDEX." Designed as an index for agricultural publications, the system included more than fifteen thousand subject divisions, and was published by the National Project in Agricultural Communications in June, 1959. Microfilm \$4.65; Xerox \$16.45. 361 pages.

AGRICULTURE, ANIMAL CULTURE

CAUSES OF VARIATION IN ESTRUAL ACTIVITY OF EWES

(L. C. Card No. Mic 59-5272)

Hal Burnett Barker, Ph.D.
Alabama Polytechnic Institute, 1959

Supervisor: Earl L. Wiggins

A 2-year investigation (May 19, 1957 to May 19, 1959) was conducted on the estrual activity in ewes of different breeds and strains maintained by the Alabama Experiment Station at Auburn. The pattern of estrual behavior was investigated in open, dry and lactating ewes.

The open group of about 20 ewes were checked twice daily for estrus at approximately 12-hour intervals

throughout the 2-year period. Dry ewes were checked in a similar manner from the end of one breeding season to the beginning of the next breeding season. Ewes that lambd were checked for estrus from the day of parturition to the beginning of the subsequent breeding season.

Criteria used in evaluating estrual activity were: date of onset and duration of the estrual and anestrual season, average length of estrual cycles and estrual periods. Some factors which might cause the occurrence of an immediate post-partum heat were investigated. The influence of nutrition on initiation of cyclic estrual activity after lambing was investigated in a group of ewes that lambd in the summer season.

There was much similarity among all groups of ewes in certain measures of estrual activity. A peak percentage of ewes in all groups was observed in estrus in the fall. Likewise, anestrus occurred in all groups of ewes in late winter and early spring, ranging in duration from 70 to 85 days. The average lengths of estrus were similar for all classifications of ewes, ranging from 2.05 to 2.50 checks. These checks were approximately 12 hours apart.

Observations on the annual estrual behavior in open Rambouillet ewes indicated three distinct types of estrual patterns. Some ewes exhibited a series of estrual cycles in two separate seasons. Other ewes had one long sexual season (fall, winter and spring) followed by a summer anestrus. A few ewes cycled throughout both years.

Absence of estrual activity throughout the breeding season (May 19 to September 1) was an apparent cause of reproductive failure in some Rambouillet ewes. The repeatability of sexual inactivity in the breeding season for dry ewes was quite low.

Most of the fall-lambing ewes involved in this study established a pattern of cyclic estrual activity while still lactating. The average intervals of sexual inactivity after parturition in each year for grade Rambouillet ewes were 73 and 86.1 days and for Dorset ewes were 38.5 and 50.5 days. One year's observations on Dorset X Rambouillet revealed an average interval from lambing to first estrus of 53.4 and 112 days, respectively. Hampshire X Rambouillet ewes that had lambd in early winter had not returned to estrus by late June. Date of lambing was identified as a factor influencing estrual behavior. The correlation between the days of lambing within the lambing season and the interval to first heat was highly significant. There was some indication that lactation had a suppressing effect on ovarian activity. Ewes that nursed their lambs for less than 10 days began cycling approximately 25 days earlier than ewes that nursed lambs for a longer period. More than 90 percent of all regular cyclic estrual activity in lactating ewes occurred in a period of increasing light.

Conception occurred in 67 Rambouillet ewes in the spring of 1958 an average of 116 days from lambing dates which were distributed over the entire lambing season. Ewes that conceived had exhibited an average of 5 estrual periods prior to conception. Supplemental feeding of ewes lambing in the summer season did not significantly influence the length of interval from lambing to first estrus.

An immediate post-partum estrus (within 15 hours after parturition) occurred in approximately 8 percent of Rambouillet ewes. Observations on a limited number of Dorset ewes indicated that incidences of post-partum estrus may be higher in this breed. No post-partum estrus occurred in ewes lambing before October 10. Repeatability of occurrence of post-partum heat was low.

The ovaries of ewes slaughtered one day after the end of post-partum heat were small and were practically devoid of follicular growth. The injection of 50 U.S.P. units of a purified oxytocin preparation was without effect in producing post-partum estrus.

Microfilm \$2.50; Xerox \$6.40. 132 pages.

OCCURRENCE OF KIDNEY CALCIFICATION IN FEMALE ALBINO RATS FED A DIET OF MILK, ALKALI AND SUCROSE: THE EFFECT OF ADDING MAGNESIUM TO THE DIET.

(L. C. Card No. Mic 60-614)

Elizabeth Louise Empey, Ph.D.
Cornell University, 1959

Kidney calcification was produced in female albino rats by feeding from weaning to age 200 or 300 days a diet of milk (supplemented with copper, manganese and iron) plus sodium bicarbonate plus sucrose. The diet was made from liquid milk or dried milk with vitamin D intakes similar on both diets. Dried milk was as effective as liquid.

Attempts were made to reverse the calcification present at 300 days of age by feeding casein-cerelose synthetic diets containing enough ammonium chloride to make the urine alkaline (pH 7.9) and containing minimal amounts of calcium or none. From comparisons of roentgenograms of kidneys removed by unilateral nephrectomy before reversal attempts, with those removed at autopsy at the end of reversal attempts, no evidence was obtained to indicate calcification had been lessened after 60 days on the diet.

Whole body roentgenograms were made of animals at the time kidneys were removed. The whole-body roentgenograms revealed presence of calcification provided cortico-medullary calcification, as judged from roentgenograms of the excised kidneys, had developed to a degree of severity as great as five on the arbitrary scale of one to six.

The aim of a second experiment was to see whether the low magnesium level in milk was a factor causing the milk-alkali-sucrose diet to produce kidney calcification. Female, weanling litter mates were fed either a completely adequate synthetic casein-cerelose control diet, or a diet of liquid milk plus sodium bicarbonate plus sucrose, or the latter diet supplemented with 15 milligrams of magnesium per 100 milliliters of diet.

Blood levels of calcium (as measured by micro-titration with ethylenediaminetetraacetate and Cal-red indicator) were the same in all groups at 155 days of age. Total magnesium plus calcium in blood was measured by micro-titration with ethylenediaminetetraacetate and Eriochrome Black T indicator, and calcium values were subtracted to give magnesium values. Blood magnesium tended to be less in the milk-alkali-sucrose-fed animals than in controls although magnesium intakes were similar (F value almost, though not quite, significant at the five per cent level). Blood magnesium levels of the group fed milk-alkali-sucrose plus magnesium were similar to

those of control-fed animals although magnesium intake was twice as high (approximately 13 milligrams per day compared with six).

Calcification occurring in the pelvic area of the kidney and in the cortico-medullary area were separated, and each was evaluated quantitatively in histological preparations made by von Kossa procedure. As judged by multiple range test and F test, the milk-alkali-sucrose diet caused cortico-medullary calcification and adding the magnesium supplement lessened its tendency to do so. Pelvic calcification was also induced by the milk-alkali-sucrose diet but was not lessened by addition of magnesium even though at least some of the magnesium supplement had been absorbed.

Microfilm \$2.50; Xerox \$7.20. 154 pages.

THE EFFECT OF ENVIRONMENTAL TEMPERATURE AND LIGHT ON THYROID ACTIVITY AND CERTAIN METABOLIC MEASURES IN SHEEP

(L. C. Card No. Mic 60-538)

Hugh Edward Henderson, Ph.D.
Michigan State University, 1958

Major Professor: H. A. Henneman

The effect of ambient temperature and artificial light on thyroid activity and other metabolic measures in ewes was conducted from June 18, 1957 to January 18, 1958.

A total of 12 experiments involving seven ewes each was conducted in controlled temperature and light chambers. Each experiment was conducted over a period of 27 days with seven days devoted to acclimatization and 20 days to collection of data. All experimental animals were maintained in a similar environment prior to being placed on experiment and self-fed feed and water prior to and during the experimental period.

Estimates of thyroid activity for each temperature and light condition studied were obtained by thyroidal uptake or retention of I^{131} , output half-time of I^{131} , l-thyroxine secretion rate, chemical analysis of thyroidal I^{127} , and histological determination of thyroid epithelial cell height.

Estimates of thyroid activity obtained by all five methods were in very close agreement with the exception of thyroidal content of I^{127} and percent uptake of I^{131} which failed to reveal any significant difference among the various temperatures studied.

It was demonstrated that ambient temperature had a profound effect on thyroid activity, with high temperature greatly suppressing and low temperature stimulating thyroid activity.

Daily body weight gains, daily feed intake per pound of body weight, daily water intake, rectal body temperature, and respiration rate were all found to be significantly affected by ambient temperature.

Ewes subjected to 12 hours of artificial light daily showed significantly greater values for thyroid activity than did ewes at 8 or 16 hours of light as measured by output half time.

Daily hours of artificial light had a significant effect

on feed consumption and respiration rate, but had little or no effect on rectal body temperature, water intake, and body weight gains.

From the correlation analysis, a highly significant inverse relationship was observed between maximum uptake or retention of I^{131} at three, five or ten days after injection and output half time. These correlations demonstrated that an actively secreting thyroid was accompanied by a low uptake or retention of I^{131} and vice versa. Retention values at ten days post injection of I^{131} were more reliable estimates of thyroid activity than three day uptakes and appeared to be a reliable inverse estimate of thyroid activity in ewes at temperatures below 90° F.

Microfilm \$2.50; Xerox \$5.40. 109 pages.

OBSERVATIONS ON THE ETIOLOGY, PROPHYLAXIS AND THERAPY OF PASTURE BLOAT.

(L. C. Card No. Mic 60-576)

Richard Harmon Johnson, Ph.D.

Iowa State University of Science and Technology, 1959

Supervisor: Norman L. Jacobson

During the years from 1956 through 1959 grazing trials were carried out on alfalfa pasture to investigate etiological factors involved in bloat and to develop effective methods of prophylaxis and therapy.

In 1956, 25 steers were divided randomly into two groups, one of which received a water-dispersible oil (lard oil) in the drinking water. The groups were reversed periodically throughout the summer and the results showed that the oil reduced bloat incidence and severity appreciably. This effect was particularly pronounced during a serious outbreak of bloat; however, it was necessary to increase the percentage of oil in the water from an initial 1 per cent to a level of 2 per cent to circumvent a decrease in water and oil consumption brought about by cold, damp weather. The oil was palatable and apparently had no adverse effects on appetite or well-being of the animals. At the close of the pasture season the same oil was given in the drinking water to animals receiving a high concentrate and low roughage ration. The oil was not so effective in preventing bloat as in the pasture trials, but little bloat was observed in either treated or control animals.

In 1957, 36 steers were divided into three groups by blocking on bloat scores; each group received various prophylactic agents in dry feed before grazing twice daily, or in water. Soybean oil, lard oil and lecithin mixed with soybean oil greatly reduced bloat for several hours when fed at the rate of 0.25 lb. or more, per animal in the grain at each feeding or at the rate of 2 per cent in the drinking water (lard oil only). Feeding oil or oil-lecithin mixtures increased weight gains appreciably, ranging from 0.07 to 0.75 lb. per animal per day for the various oil treatments. Penicillin (75 mg. per animal daily) reduced bloat for nine days, but subsequently its effectiveness diminished rapidly. Increasing the penicillin to 125 mg. reduced bloat for a period of two days, after which bloat incidence increased sharply. Animals receiving penicillin gained 0.44 lb. per day more than controls.

In 1958, 41 dairy and beef cattle were divided into three

groups by blocking on bloat scores. Six of the animals which had been fistulated were used for studies of rumen fluid characteristics and other etiological factors. Soybean oil at the rate of 0.25 lb. per animal prevented bloat for 3 to 4 hours when fed in the grain immediately before grazing. Increasing the concentration of oil to 0.5 lb. per lb. of grain made the mixture unpalatable and reduced consumption by some individuals, making evaluation difficult. A mixture of oil with ground corn cobs and grain was less effective than a mixture of oil with grain alone; feeding ground or flaked raw soybeans had little or no effect. Erythromycin (75 mg. per animal per day) reduced bloat severity for several days but the effect soon decreased and was not restored when the antibiotic was reintroduced after 26- and 15-day periods. Corn lecithin apparently prevented bloat efficiently, but observations were limited in number. Soybean lecithin mixed with methyl esters of fatty acids gave variable results. Neither gastric mucin, corn distillers' dried solubles nor *ad libitum* feeding of timothy hay prevented bloat. Phosphate fertilization did not reduce bloat. An *in vivo* technique involving the fistulated steers indicated that the rate of dry matter digestion in the rumen was slower when the forage fed was more mature or when oil was administered to the animals.

In 1959, approximately the same number of animals and the same procedures were used as in the 1958 trials. Results indicated that the period of effectiveness of antibiotics can be extended considerably by feeding several different antibiotics in rotation or by feeding them in combinations. Those found particularly effective were penicillin, erythromycin and tylosin. Chloramphenicol and novobiocin were slightly less effective; oxytetracycline, neomycin and spontin were of questionable value. Penicillin and erythromycin were more effective for a longer period of time when fed together than when fed in rotation.

Analysis of forage composition and observations of weather conditions revealed no consistent differences correlated with bloat. Determination of rumen fluid characteristics showed that surface tension increases and specific gravity decreases during froth formation and during bloat.

Two emulsified oils--lard oil and an emulsified oil developed especially for the purpose were effective in relieving serious bloat in 181 of 194 cases treated; 8 animals required further treatment (usually with more of the same oil) and 5 died. In limited trials, soybean oil appeared less effective (due to slower action) than the emulsified oils.

Microfilm \$3.10; Xerox \$10.80. 238 pages.

RESPONSE OF SWINE TO MECHANICAL AND HORMONAL STRESS

(L. C. Card No. Mic 59-6380)

Mike Milicevic, Ph.D.

University of Missouri, 1959

Supervisors: Dr. John F. Lasley and Dennis T. Mayer

A study was made of the physiological response of swine to mechanical and hormonal stress. The investigation of mechanical stress utilized sixty-one pigs of the Landrace, Poland, Duroc and Hampshire breeds. The response to stress was measured by changes in different kinds and

numbers of leucocytes in the blood stream after mechanical stress was applied. Significant breed differences were noted in numbers of total white cells and neutrophils. Possibly this breed difference was due to the level of A.C.T.H. being secreted. The physiological response to stress as induced by insulin was also studied in five Duroc and six Landrace x Poland sows at four different stages: prior to pregnancy, early pregnancy, late pregnancy and lactation. The response to stress was determined by measuring changes in blood glucose and changes in the type and number of leucocytes in the blood stream after the hormone was injected. The dosage of insulin used was 0.2 units per kilogram body weight. The blood glucose studies showed that the sows were less sensitive to insulin during lactation. The lymphocyte and neutrophil numbers indicated also that an insulin antagonist was being secreted at a higher level during lactation. Possibly this insulin antagonist was the growth hormone.

Microfilm \$2.50; Xerox \$6.60. 136 pages.

**A STUDY OF THE RELATIONSHIPS AMONG
INTRA-RUMEN FACTORS AND THEIR INFLUENCE
ON DIGESTION OF A LOW ASH RATION
SUPPLEMENTED WITH ALFALFA ASH**

(L. C. Card No. Mic 60-610)

James William Gordon Nicholson, Ph.D.
Cornell University, 1959

Major Professor: Professor J. K. Loosli

Two experiments were conducted. The first was designed to study conventional digestibilities and nitrogen retention on four rations and to relate these to changes in intra-rumen environment including pH, freezing point and volatile fatty acid concentrations in rumen fluid, and the total weight and percent water and ash of the rumen contents. Water consumption and the 24-hour loss in weight of cotton loops suspended in the rumen were also recorded. Rumen fistulated, yearling animals (two steers and two bulls) were used in a 4 x 4 latin square design. In the second experiment feed consumption and growth of calves (8 calves per ration) were recorded. The calves were approximately two months of age at the beginning of the experiment and were fed for eight weeks.

The basal ration used in the first trial was composed mainly of corn cobs and corn starch with urea, soybean oil meal and a small amount of timothy hay. All rations were supplemented with minerals to meet N.R.C. recommendations and with stabilized vit. A and D. In the first experiment the basal ration was supplemented with three and six percent of alfalfa ash. In addition a control ration of timothy hay and soybean oil meal was fed.

The addition of alfalfa ash to the basal ration used did not result in an improvement in digestibility or nitrogen retention. Likewise the ash did not have statistically significant effects on volatile fatty acid production, rumen pH, freezing point of rumen fluid, total weight of rumen contents, amount of dry matter in the rumen (very close to significance) or rate of breakdown of cotton loops suspended in the rumen. There were significant effects on percent of water in the rumen ingesta, daily water con-

sumption and urine excretion as well as percent of ash in the rumen ingesta.

Correlation analyses indicated a close relationship between daily ash consumption and weight loss of cotton loops suspended in the rumen. The ash intake was also related to water consumption and it was suggested that the increased percentage of water in the rumen ingesta resulted in the increased loss of weight by the loops. The correlation coefficients also indicated that rumen pH depended primarily on the concentration of volatile fatty acids but was also related to the water and ash content of the rumen ingesta. Fluctuations in freezing point of rumen fluid could be attributed primarily to variations in the volatile fatty acid content.

In the second experiment the basal ration was similar to that used in the first except that no timothy hay was fed. The basal ration was supplemented with either a special mineral mixture of equal parts of magnesium, potassium and calcium as carbonates and sodium bicarbonate at the level of 3 percent of the ration, alfalfa ash at 3 percent or alfalfa hay equivalent in amount to that required to supply the ash.

Feeding the special mineral supplement improved feed consumption and tended to improve growth over that on the basal ration. The alfalfa hay and alfalfa ash supplements also gave small responses but they were not different statistically from the other rations. It was suggested that the beneficial effect of the alkaline mineral supplements was due to their buffering effect in the rumen. Feeding the special mineral supplement or alfalfa ash resulted in an alkaline urine while the basal ration resulted in an acid urine.

Microfilm \$2.50; Xerox \$5.40. 110 pages.

**ANALYSES OF PHYSICAL SOURCES OF
VARIATION IN ESTIMATED GENETIC
GROWTH PARAMETERS IN BEEF CATTLE**

(L. C. Card No. Mic 60-319)

Samuel Waybright Sabin, Ph.D.
Oregon State College, 1960

Major Professor: Ralph Bogart

Test gains, total gains and final weights of 330 bull and heifer calves, born during the period of 1953 to 1957 inclusive, in four lines of the University of Wyoming experimental beef herd, were analyzed by least squares methods. Four analytical models were used to compare the relative magnitudes of several sources of variation when birth weights and suckling gains were considered singly or together as sources of environmental variance or both considered as non environmental or genetic sources of variance. A paternal half-sib analysis of variance for each trait adjusted to comparable basis according to each model provided genetic, environmental and phenotypic estimates of the variance and covariances for each trait plus genetic, environmental and phenotypic correlations among the traits under the various assumptions concerning each model. Heritability estimates were also computed for each trait under the same conditions.

Coefficients of determination indicate that test gains

were largely unaffected by suckling gain differences and only slightly by birth weight differences. Both total gain and final weight were subject to large differences as a result of suckling gain difference but not by differences in birth weight. Estimates of the genetic variance of each trait provide evidence that of the variance associated with differences in suckling gains, an important part is genetic in origin. By eliminating the variance due to suckling gains, a large part of the genetic variance of each of the other production traits is also eliminated.

An extremely high genetic correlation between suckling gain and test gain is evidenced by the reduction of the genetic variance of test gain when suckling gains are considered. A possible negative genetic correlation is postulated between birth weight and test gain on the basis of the extremely low genetic variances when suckling gains are considered and birth weight ignored. The relatively high heritability estimates when both birth weight and suckling gain are ignored tend to substantiate these theories. The extremely high genetic correlations between test gains and total gains in contrast with the slightly lower genetic correlation between test gain and final weight is considered as further evidence for the proposed theories.

Of the sources of environmental variance, sex was responsible for the greatest difference in each trait with males gaining up to 63 pounds more on test, up to 89 pounds more over-all and finishing feed tests up to 94 pounds heavier.

Year differences were large. Comparisons of test gains and total gains between years indicate a tendency for calves to make greater test gains when they were preceded by low suckling gains.

Calves from two-year-old dams failed to gain as rapidly or finish the performance test as heavy as other calves. Dam selection on the basis of the performance of her offspring was considered at least partially responsible for the high performance of calves from ten-year-old dams, however, little difference was noted among calves from dams over four years old.

Laramie Shorthorns consistently outperformed other breeds with Laramie Hereford and Angus about equal. Gillette Herefords were consistently the lowest producers possibly due in part to a higher inbreeding coefficient.

Age at weaning had no effect on test gains but was responsible for a considerable difference in total gain and final weight when suckling gains were ignored.

Birth weight had a significant influence on each trait with heavier birth weights associated with greater gains and heavier weights.

Although suckling gains had little influence on test gains, total gains and final weights were significantly increased by increases in suckling gains.

Microfilm \$2.50; Xerox \$4.20. 78 pages.

BIASES IN ESTIMATING REPEATABILITY OF MILK AND BUTTERFAT PRODUCTION

(L. C. Card No. Mic 60-596)

Lyle Harry Wadell, Ph.D.

Iowa State University of Science and Technology, 1959

Supervisor: Jay L. Lush

The 13,747 D.H.I.A. lactation milk and butterfat records of 4,836 Holstein dairy cows in 15 Iowa State Institutional herds were studied to find why two methods of estimating repeatability gave different results.

Method one is a weighted combination of three different estimates of repeatability, each derived from a simple regression coefficient. Method two is the intraclass correlation obtained as a ratio of variance components computed from an analysis of variance of all records.

Curvilinearity was much too small to influence the estimates materially.

Inequality of the means of the age-corrected records for various lactation orders caused the intraclass correlation to be around 0.02 less than if the variance from those inequalities had been discounted. Inequality of the age-corrected means had less effect on the regression estimate, causing an average decrease of only 0.004 in it.

The effects of selection were studied on the 2,914 cows who had both first and second records. When the differences between the means of first records and the means of second records of cows who had both were ignored, the intraclass correlation decreased by 0.02 for each increase of 5 percent in this truncation selection. This decline in the computed intraclass correlation was practically eliminated by correcting for inequality of means of the first and second lactations. The necessity for such a correction wherever the order of the items (records) within classes (cows) is pertinent has always been recognized in the theory of intraclass correlations but has often been neglected in practice. If the variance component method is used to compute repeatability, the data should be examined for inequality in the means and corrected if necessary. In many cases such a correction might be difficult enough to make to warrant using the regression methods.

Biases because of (1) the reduction of the environmental variance in the first records of those cows which have second records and (2) a negative correlation between the cow's real ability and the errors in her earlier records were discussed, but no clear way of measuring those separately was found.

The regression method makes no use of any information about cows which have only one record. The weighting in it emphasizes heavily the regression of second record on first, which was larger than other regressions of a record on a prior record. Regressions on adjacent records were larger than on records one or two lactations further back. Regressions should be unbiased by selection practiced solely on prior records but can be biased if selection was partly on other things which are correlated both with prior records and -- through other paths -- with future records. The cows who have no second record seem a heterogeneous group and the relation of second record to first seems not the same as the relation of a third or a fourth record to the immediately preceding record.

Microfilm \$2.50; Xerox \$6.00. 121 pages.

**THE TENDERNESS OF BEEF AS RELATED
TO TISSUE COMPONENTS, AGE, STRESS AND
POST-MORTEM BIOCHEMICAL CHANGES.**

(L. C. Card No. Mic 59-6388)

Neil Broyles Webb, Ph.D.
University of Missouri, 1959

Supervisor: O. J. Kahlenberg

The purpose of this investigation was to study the factors associated with differences in the tenderness of beef. The results of an investigation of this nature should ultimately assist in supplying beef which is uniformly tender.

The objectives of this investigation were (1) to determine the tissue components responsible for variations in tenderness of meat; (2) to determine the influence of chronological age, physiological stress and post-mortem environment on muscle composition and tenderness; and (3) to develop methodologies to evaluate the effects of breeding, management, processing and cooking on meat tenderness.

Eight steers of different chronological ages were given ante-mortem stress treatments, slaughtered and one side aged at high temperature for three days and the other side aged at low temperature for fifteen days. Samples were taken to determine changes in biochemical properties and tenderness during aging. Fifty additional carcasses were obtained to study the effect of chronological age, ante-mortem stress, carcass grade, and different muscles on tenderness at the termination of fifteen days aging. In addition these carcasses were used to compare and develop methods of tenderness evaluation.

Tenderness improved during aging and was found to be associated with changes in pH, water-holding capacity and water-extractable nitrogen and minerals. The water-holding capacity of the muscle was affected by the changes in pH during aging.

Tenderness was not directly related to water-extractable sodium, potassium, magnesium, calcium, phosphate or nitrogen, but the interrelationships and transfers of these components in association with the protein and moisture components of the meat produced an increased tenderization during aging. The transfers of moisture and mineral ions appeared to be associated with the changes involved in the development and resolution of rigor mortis.

The carcasses from the control cattle were significantly more tender than those from the stressed cattle when both the beginning and end of the aging periods were considered. However, stress did not have a significant effect upon tenderness when measured only at fifteen days post-mortem.

Tenderness decreased significantly as the cattle increased in chronological age. The U. S. Choice grade carcasses were significantly more tender than the U. S. Cutter grade carcasses.

Magnesium was the only mineral constituent present in the expelled juice of the water-holding capacity determination that appeared to be related to tenderness. The pH of cooked meat increased while the pH of the expelled juice decreased when fresh meat was cooked in the water-holding capacity tubes. The protein alterations which occurred during the cooking process apparently eliminated

any gross differences in texture due to the pH of the raw meat.

Tenderness values were correlated significantly between the organoleptic panel and the Warner-Bratzler shear device. The values of the Kramer shear press correlated significantly with those of the Warner-Bratzler shear device.

Hydroxyproline in fresh beef muscle had a significant negative correlation with the tenderness values obtained by organoleptic evaluation. However, sample variation for the hydroxyproline determination indicated that a more precise method is needed.

A technique was developed to measure tenderness simultaneously with the determination of water-holding capacity values.

Microfilm \$3.15; Xerox \$11.05. 244 pages.

**AGRICULTURE, FORESTRY AND
WILDLIFE**

**EXPERIMENTAL BURNING, FERTILIZING, AND
SEEDING ON UTILITY LINE RIGHTS OF WAY.**

(L. C. Card No. Mic 59-5271)

Dale Howard Arner, Ph.D.
Alabama Polytechnic Institute, 1959

Supervisors: Arnold O. Haugen and Allen M. Pearson

Prescribed burning, fertilizing, and seeding were conducted during 1956 and 1957 on utility rights of way in Alabama to gain the following information: (1) the feasibility of using such techniques in increasing quail food plants on rights of way; (2) the effectiveness of these treatments in reducing woody vegetation; (3) the effectiveness of these treatments in reducing soil erosion. Two segments of Southern Natural Gas Company line rights of way were selected. One was on a sloping site, and one on a nearly level site; both areas were in the Upper Coastal Plains Soils Province. A third area located on Alabama Power Company right of way, was selected in the Piedmont Soils Province. Sixteen plots, each one-twentieth acre in size, were established on each site for testing purposes. Quantitative vegetational analysis was conducted at the end of each growing season.

In 1956, two line intercepts, each fifty feet in length, were located on each plot in two of the areas. Statistical comparisons were made to determine gain in information of per cent quail food plant coverage by the use of two line intercepts versus a single line intercept. The use of two line intercepts on the North Auburn Area produced a 57 per cent gain in information. The use of two lines on the Rencher Area produced only a 21 per cent gain in information. In 1957, one randomly selected line intercept and one systematically selected clipped strip were used on each plot.

A fourth area on the Lower Coastal Plains Soils Province was established in 1958. Twelve one-fourth acre plots were selected for burning, fertilizing, and seeding treatments. One line intercept, fifty feet in length, was randomly established for each plot.

Fertilizing and seeding appeared to be essential in increasing quail food plants and in reducing the percentage of bare ground. The percentage of native quail plant coverage was also increased on the majority of the plots. Burning was useful in combination with fertilizing and seeding only on those plots with a stand of native vegetation dense enough to compete with the seeded species. At the end of the first year differences between treatments in increasing quail food plants were evident although not statistically significant. Climatological data revealed far more favorable growing conditions the second year of experimental work. Rainfall was more than twice that of the first year; evaporation, high temperatures, and relative humidity minimums were all considerably reduced over that of the first year. With more normal climatic conditions prevailing the second year, significant differences between treatments were obtained for all areas. Fertilizing and seeding increased the coverage of quail food plants and reduced the percentage of bare ground on both the burned and unburned plots over that of unfertilized and unseeded burned and unburned plots.

Burning was the only treatment tested which significantly reduced woody vegetation. This reduction was possible only when the herbaceous vegetation was dense enough to produce a "hot" fire.

Microfilm \$2.50; Xerox \$6.80. 143 pages.

AGRICULTURE, PLANT CULTURE

THE EFFECT OF LIME ON THE AVAILABILITY OF PHOSPHORUS ON SEVERAL JORDAN PLOT SOILS

(L. C. Card No. Mic 59-6759)

Abdul Bari Awan, Ph.D.
The Pennsylvania State University, 1959

The objective of this investigation was to determine the effect of lime on the availability of P. Jordan Soil Fertility Plots 24, 28, 32, and 34 of the unlimed tiers were selected for the purpose of this study. The past treatments and pH values were as follows:

Plot No.	Past Treatments	pH of the Soil
24	Nothing	5.2
28	N P K (N as NaNO_3)	5.1
32	N P K (N as $(\text{NH}_4)_2\text{SO}_4$)	4.3
34	2 Tons Limestone	8.0

First, an inventory of the soil P was undertaken. The fractionation of the soil P into total, inorganic and organic P showed highly significant differences among the four plots. The highest accumulation of total P was found in plot 32, because little P was removed from the soil due to low crop yields. Liming of the acid soil to pH 8 on plot 34 liberated soil P causing a decline in the total P. The

continued overliming of acid soils resulted in an increase in the percent organic P in the soil. The greatest concentration of P was found in the surface soils. The pH of the soil profiles of the four plots reflected the previous fertilizer treatments.

Following the inventory, a greenhouse experiment was designed to study the effect of lime, with and without additional P, on the availability of P as measured by the yields and P content of tall fescue (Ky. 31) clippings and roots. Three different lime levels were used. The original soil constituted the zero level. In the second level, enough lime was added to raise the pH to 7.2. The third level consisted of an excess of 5 tons per acre of lime above the pH 7.2 creating a final pH of 8.0. All treatments included a uniform application of N and K.

Highly significant increases in the yields were obtained from both the first and the second lime level as compared to the zero level. However the increase in yield at the second lime level over the first level was not statistically significant. Liming of soils with a pH of 5.1 or above did not significantly increase the development of roots. However, liming an exceedingly acid soil as in plot 32 did increase root growth.

The general effect of liming the acid soils was a rise in the P content of fescue when the soil was limed to pH 7.2 followed by a slight decrease when overlimed to pH 8.0. The Ca content of fescue was also significantly increased. The total uptake of P by fescue was increased by the presence of a high concentration of Ca.

Five different methods were used for the extraction of available P from the soil samples collected prior to the seeding and also after the harvest of fescue. The previous history of the soil and the P level had a considerable effect on the amount of P removed by the extractant in all five methods. When the sodium acetate, Truog and the continuous leaching methods were used, the data showed that the liming of acid soils increased the availability of the native soil P and the efficiency of the applied P. However Bray's (.1 N HCl and .025 N HCl) methods showed a decrease in the availability of both the native and applied P.

Finally simple correlations between the available P as measured by the five methods and the yield, percent P and total P uptake by fescue were calculated. The sodium acetate method gave a highly significant correlation with yield and the total P absorbed by fescue. Truog and continuous leaching method also showed some correlation but this was not statistically significant. Both Bray methods gave a negative correlation which indicated that they are not suitable for testing the effect of lime on the availability of P. Microfilm \$2.50; Xerox \$5.60. 113 pages.

**EFFECT OF PHOTOPERIOD AND TEMPERATURE
ON FLOWERING OF WHITE CLOVER
(*TRIFOLIUM REPENS*)**

(L. C. Card No. Mic 60-567)

Durwood William Beatty, Ph.D.
Iowa State University of Science and Technology, 1959

Supervisors: Iver J. Johnson and Walter E. Loomis

Greenhouse and field studies were conducted during the period 1956-59 to determine the effects and interactions of cold temperature, photoperiod, and chemical spray treatments on the floral development of white clover. Nine clones of Ladino clover and ecotypes of common white clover from Arizona, Michigan, and Minnesota were used for the study.

Photoperiodic responses varied from short-day type for the Arizona clone to long-day type responses for the Ladino clones. Long-day types flowered earlier as the length of the photoperiod was increased. Previously inducted plants of the Arizona clone flowered earlier but less profusely as the photoperiod was lengthened, suggesting that the primary effect of long day on this clone is to hasten the development of flowers already initiated. Uninducted plants of the Arizona clone did not flower under long photoperiods. The greatest variability among the Ladino types was observed near the threshold daylengths of 14 to 15 hours. These daylengths allowed the best separation of photoperiodic responses.

Flowering of the wild ecotypes was markedly increased by exposure to cool fall conditions. The role of temperature appears to be of considerably greater significance in the flowering of some clones of white clover than previously noted. The Minnesota clone appeared to have an obligate requirement for cold temperature induction.

Temperature treatments modified the photoperiodic requirement of the clones, causing long-day plants to flower under short daylengths and causing short-day plants to flower under long days.

With some clones exposure of plants to cold nights was as effective in increasing the flowering as exposure of plants to continuous cold day and night. Flowering was not increased by exposure of plants to cold days and warm nights.

Under conditions of the experiment chemical spray treatments did not increase flowering. Gibberellic acid delayed or prevented flowering of the Arizona clone.

The study shows clearly that both daylength and temperature may be important factors in the flowering of white clover; that clones vary in their response to each or to combinations of the two factors; and that an understanding of the two is essential for adequate evaluation of possible genetic shifts in populations which may come about as a result of seed production in an area apart from where the seed will be used. The influence of temperature and daylength is of considerable importance in greenhouse work where reproduction of seasonal conditions is desirable to accelerate plant development or to keep plants in a vegetative stage.

Microfilm \$2.50; Xerox \$4.80. 93 pages.

**THE CYTOLOGY AND BREEDING BEHAVIOR
OF *R. CANADENSIS* L.**

(L. C. Card No. Mic 59-3431)

Donald Laird Craig, Ph.D.
University of New Hampshire, 1959

Clones of *R. canadensis* were found to vary in cane height, cane diameter, plant vigour, degree of spininess and fertility.

Crosses between the spineless triploid facultative apomictic *R. canadensis* and tetraploid varieties of blackberries resulted in fertile hybrids. *R. canadensis* crossed with Lowden, Hedrick and Bailey blackberries produced triploid and pentaploid seedlings. The triploid seedlings were morphologically identical to *R. canadensis*. The reciprocal cross produced diploid, triploid, tetraploid and pentaploid seedlings as well as some seedlings with an unstable chromosome number. These results agree with observations on microsporogenesis where irregular configurations and asynaptic divisions were observed. Pollen grains were irregular in size and approximately 70 per cent aborted.

An F_2 generation of a tetraploid hybrid seedling produced spineless diploid seedlings, spiny tetraploid seedlings and spineless tetraploid seedlings.

It was concluded that the very desirable characteristics of *R. canadensis* could be transferred to cultivated blackberries through a proper breeding procedure.

Microfilm \$2.50; Xerox \$4.40. 83 pages.

**FACTORS REGULATING HERBICIDAL
EFFECTIVENESS OF 3-(P-CHLOROPHENYL)-1-1
DIMETHYLUREA (MONURON) ON BEETS.**

(L. C. Card No. Mic 60-613)

Leonard William Feddema, Ph.D.
Cornell University, 1959

The problem investigated concerned the lack of uniformity of the results obtained when monuron is used at selective rates in beets for control of the weed pest *Chenopodium album*. This variability in herbicidal action was taken as an indication of the monuron available to plant roots. Variations in plant response was used as an indication of monuron effectiveness. The factors responsible for variation in beet plants were tested under field conditions and results indicated that location, stage of seedling development and soils were important factors regulating monuron activity, whereas the quantity of irrigation water supplied subsequent to monuron application was unimportant.

Laboratory studies of factors regulating the quantity of monuron available in soil solutions indicated that the electro-chemical forces of adsorption to be minor. These data were drawn from experiments using synthetic resins in columns and in prolonged contact with solutions of monuron. Decreases in monuron either in the effluent or bathing solution indicated that the quantity of monuron retained was far below that expected if the monuron molecules had accepted protons at either or both of the ammonia groups in the substituted urea chain.

Differences in monuron retention by soils was best correlated to an organic soil fraction which was readily oxidized by hydrogen peroxide. Raw organic matter which had not undergone any decomposition by microorganisms did not have the ability to influence monuron effectiveness, suggesting that an organic component, perhaps a product of decomposition, combines with monuron and thereby renders the molecule inactive or unavailable. This component could probably vary with location and within a location and produce the variation in effectiveness when monuron is used at low rates for selective weed control.

Microfilm \$2.50; Xerox \$3.80. 66 pages.

FRUIT SET OF HAND-POLLINATED FLOWERS OF PEACH (*PRUNUS PERSICA*) AND APRICOT (*PRUNUS ARMENIACA*) IN DIFFERENT MICRO-ENVIRONMENTS.

(L. C. Card No. Mic 60-550)

Fenton E. Larsen, Ph.D.
Michigan State University, 1959

Major Professor: James E. Moulton

A series of studies was conducted in 1957 and 1958 to determine the value of several types of materials as protectors against adverse weather conditions. These materials were made into two-by-four-foot bags and placed over large peach and apricot branches with emasculated and hand-pollinated blossoms. The object of these studies was to increase fruit set in the peach and apricot breeding program at the Michigan State University South Haven Experiment Station. This was desirable since the weather at bloom has often been poor, and, as a result, the fruit set in the breeding program has usually been ten percent or less.

In 1957 and 1958 three types of protectors -- polyethylene, waxed parchment, and unwaxed parchment -- were used immediately after pollination for varying periods. At one location in 1957, fruit set of Perfection apricots was reduced by all protectors which were applied for three weeks. The reduction observed was mostly due to frost while the protectors were on, although high day temperatures may have been partially responsible. The set on branches protected for a one-week period was comparable to the control. At another location, the fruit set of Henderson apricots in the waxed and unwaxed protectors was significantly better than the control after a three-week treatment. However, the set was significantly reduced in the polyethylene protectors. During the same year, fruit set of Redhaven peach on branches covered by unwaxed protectors was significantly increased compared to the control and other treatments. Again, the set was significantly reduced by the polyethylene protectors.

In 1958 the length of treatment was reduced to five days. At one location, fruit set of Perfection apricots was not significantly increased by the protectors. Many fruits were lost due to frost damage. At another location, however, the set of Henderson apricots was significantly increased in the waxed protectors, compared to the control and all other treatments. In the unwaxed parchment protectors, the set of Henderson apricots was also signifi-

cantly better than the control. The polyethylene protectors significantly reduced the set of Henderson apricots. Fruit set of Redhaven peaches was significantly increased by the unwaxed protectors.

Temperatures taken inside these protectors by the use of thermocouples were found to be, always, from one to two degrees F. lower at night than outside and from five to as much as 28 degrees F. higher than outside during the day.

In 1958 supplementary frost protectors were made of fiberglass and aluminum foil, black polyethylene and aluminum foil, multilayered brown paper bags, and blanket type insulated materials. The latter were made of sides of double layers of brown paper with shredded paper in between. After the five-day treatment with the waxed and unwaxed parchments and the polyethylene protectors, the frost protectors were placed over one lot of the treated branches during nights when frosts occurred. No significant benefit was obtained from the supplementary frost protectors, and all but the fiberglass - aluminum foil protectors usually reduced fruit set because of low inside temperatures.

In 1959 attempts were made to determine the approximate time between pollination and fertilization of Henderson apricots under controlled conditions in the laboratory. This was done by crushing the pistils and using the Lacmoid-Martius yellow staining technique. Fertilization did not occur normally on excised branches, but studies in the field using the same staining technique indicated this period to be about four days. An approximate period of four days from pollination to fertilization was also indicated for Perfection and South Haven apricots 6 and 7 by studying pollen tube growth from full bloom. Limited observations indicated that the time between pollination and fertilization of Redhaven peaches was also four days.

Microfilm \$2.50; Xerox \$5.80. 118 pages.

VARIABILITY IN SUCCESSIVE BACKCROSS GENERATIONS OF OATS

(L. C. Card No. Mic 60-580)

Lester Norman Leininger, Ph.D.
Iowa State University of Science and Technology, 1959

Supervisor: Dr. K. J. Frey

Backcrossing has been used for many years by plant and animal breeders to transfer simply inherited characters from one strain to another. Recent interest has been shown in the possible use of backcrossing to transfer complexly inherited characters. The means and variances for yield, heading date, height and weight-per-volume were obtained in four successive generations of backcrossing to determine whether actual data would verify the statistical theory of backcrossing. Cherokee and P.I. 185786, two varieties which differed widely for a number of characters, were used as the recurrent and non-recurrent parents, respectively.

The experiment was conducted in such a way that the data would apply in answering the following questions: (a) do quantitative characters regress toward the recurrent parent performance at the rate theorized for qualitative

characters when no selection is practiced; (b) what effect would selection among backcross plants for the recurrent parent phenotype or crown rust resistance have upon the rate of regression; and (c) how many generations of backcrossing would be needed to obtain means and variances in the backcross generations which were equal to those of the recurrent parent?

In general, the means for date of heading, plant height and weight-per-volume regressed toward the recurrent parent with successive generations of backcrossing but at rates different than expected on the basis of additive gene action. Plant height and weight-per-volume returned at a rate slower than expected and date of heading returned faster than expected. Mean yield showed considerable heterosis and there was no indication of a return to the recurrent parent. The variances were somewhat erratic, but, in general, they were reduced with additional backcrossing. Height and weight-per-volume variances were reduced very little until the fourth backcross while date of heading and yield variances were higher in the third than in the second or fourth backcrosses.

Selection for lines with heading dates like the recurrent parent would have been effective in causing all quantitative characters except weight-per-volume to regress toward the recurrent parent phenotype more rapidly than if random crosses had been made. There was no apparent beneficial or detrimental linkage drag associated with the rust resistance gene contributed by the non-recurrent parent.

The data was not sufficient to allow any prediction of the proper number of backcrosses to obtain the recurrent parent type for any character except date of heading. Since the mean and variance for date of heading had returned faster than expected by the fourth backcross, it appeared that a total of 5 or 6 backcrosses would have been sufficient for this character.

The means and variances indicated that epistatic gene action was involved in the determination of date of heading and yield, whereas weight-per-volume and height probably resulted from dominance and additive gene effects.

Microfilm \$2.50; Xerox \$3.00. 49 pages.

INHERITANCE AND NATURE OF CUCUMBER MOSAIC VIRUS RESISTANCE IN SQUASH

(L. C. Card No. Mic 60-617)

Mark Wayne Martin, Ph.D.
Cornell University, 1959

Most commercial varieties of *Cucurbita pepo* are very susceptible to cucumber mosaic virus (CMV) and serious losses sometimes result in commercial fields. The other commercially important species of squash have at least a moderate degree of resistance to CMV infection and although severe cucumber mosaic symptoms will sometimes be observed in these other species late in the fall there is seldom any reduction in fruit quality or yield.

This work was undertaken to investigate the nature and inheritance, and the physiological relationships of several possible parents which might be used in breeding CMV resistance into susceptible *C. pepo* varieties.

The environment was found to be very important in

determining the response of squash plants to inoculation with CMV. Light intensity and soil nitrogen level were found to be the two most important aspects of the environment. Lowering the light intensity or applying nitrogen to the plants or to the soil markedly increased the susceptibility of squash plants to CMV infection.

A nitrate test involving the use of diphenylamine was used to estimate the nitrogen content of the plants, and there was a positive association between nitrate content of the plant and susceptibility to CMV infection in all the environments tested. This association suggested that environments such as low light intensity increase susceptibility indirectly through their effect on the nitrogen content of the plant. There did not seem to be a consistent relationship between the carbohydrate content of squash plants and their susceptibility to CMV infection.

The use of phosphate buffer (pH 7.2) as a diluent greatly increased the efficiency of inoculation; results indicated that this was an effect on the virus or inoculum and not on the host. Different regions in a block of frozen juice differed markedly in their infectivity, especially if the juice had been thawed and refrozen; the darker-green regions of the frozen inoculum which contained more plant material were the most infectious.

Results of studies on the early phases of infection in inoculated seedling cotyledons by means of a starch-lesion technique showed that plants of the resistant varieties had very little, if any, resistance to virus establishment or virus multiplication in the cotyledons. Resistant plants appear to have a protective mechanism which hinders virus translocation. If the virus overcomes this protective mechanism and reaches the growing point it can apparently multiply unhindered and produce cucumber mosaic symptoms; it seems unlikely, therefore, that resistance in these varieties is due to a lack of precursors or substrates or to hypersensitivity.

Two resistant *C. pepo* lines, 176959 and 174192, were crossed with each other and with five susceptible *C. pepo* lines, and inheritance studies were conducted on F_1 , F_2 , and backcross progenies. The results suggest that the CMV resistance of these two lines is controlled by two recessive genes in each parent. There is evidence that these two parents share a recessive gene for resistance which by itself can confer "field" resistance but that this "shared" gene must be accompanied by a second complementary gene from either of the parents before resistance under more severe conditions is produced. Both genes together, however, will not completely prevent infection under extremely severe conditions.

CMV resistance in *C. maxima* and *C. moschata* variety Butternut seems to be controlled by a recessive gene or genes. However, in the highly resistant *C. moschata* variety Batangas Native, resistance is apparently controlled by a dominant gene or genes.

Microfilm \$2.60; Xerox \$9.00. 198 pages.

AGRONOMIC, GENETIC AND CYTOLOGICAL INVESTIGATIONS ON VIGOR OF ESTABLISHMENT, GROWTH FORM AND OTHER MORPHOLOGICAL CHARACTERS IN BIRDSFOOT TREFOIL (*LOTUS CORNICULATUS* L.).

(L. C. Card No. Mic 60-602)

Iraj Poostchi, Ph.D.
Cornell University, 1959

Agronomic, genetic, cytological, and fertility relationship studies have been carried out on three varieties of broadleaf birdsfoot trefoil, *L. corniculatus* L. These varieties were Viking, Empire, and Arvensis. The plants of these three varieties were crossed in all possible combinations. Each flower was emasculated for the purpose of crossing. The injurious effect of emasculation and desiccation was minimized by keeping flowers moist prior to pollination. Some of the parents used in the original crosses and their F_1 plants responded to selfing.

In agronomic studies, vigor of establishment was measured in terms of stem length (height) and dry matter production. It was found that Viking-Arvensis F_1 plants showed greater growth of stem length than Empire-Arvensis crosses in 13 out of 16 determinations, and a greater dry matter yield in 9 out of 10 determinations for trials both in the field and the greenhouse. Plants of the F_1 and backcross generations showed greater stem length growth in all determinations made, and produced more dry matter than the F_2 generations in 13 out of 14 determinations.

Rate of recovery studies following harvest for forage showed that in 13 out of 14 determinations Viking-Arvensis hybrids recovered faster as measured by height of stem and yield of regrowth than did Empire-Arvensis hybrids.

Results of agronomic studies indicated that many genes are responsible for development and expression of stem length and yield of dry matter. Vigor of establishment due to Viking was transmitted to progenies from crosses with Arvensis and Empire in their F_1 , F_2 , and backcross generations. The early flowering habit of Viking and Arvensis in Viking-Empire and Arvensis-Empire crosses was found to be dominant over the late flowering habit of Empire, assuming that the first two weeks of June and July are the typical flowering period for Viking and Empire respectively.

Genetic studies revealed that habit of growth, flower size, leaf size, and brown keel-tip color are under the control of multiple factors. The F_1 and backcross plants showed values for these characters which were intermediate between those of the parents, and shifted in one direction or another depending on which parent was used in the backcross. These characters showed the cumulative effect of multiple genes in the backcrosses. The inheritance of leaf color and flower color seemed to be controlled by one gene. The backcross ratios for these characters approximated the 5:1 tetrasomic ratio expected for single gene inheritance on the basis of random chromosome segregation.

Cytological investigations showed that chromosomes paired regularly as bivalents. Quadrivalents were formed, but this was not observed frequently. Regular chromosome counts made of parent plants and their F_1 and F_2 progenies at Prophase II showed 12 distinct chromosomes. All of the 40 plants used in this investigation showed at

least one laggard chromosome per cell at some stage of meiosis. Disregarding the major contributions made by two plants to laggard formation in parental and F_1 self-sterile classes, the number of cells showing laggards was highest for the F_2 class.

The prevalence of functional microspores was greatest in the parent class and smallest in the F_2 class. This class had the highest number of aborted pollen grains.

Fertility relationships are measured by the number of seeds per flower differed with different methods of pollination. The number of seeds per flower and the number of pods per flower were lowest in selfed F_1 plants and highest in sibbed F_1 plants with backcrosses being intermediate. Further, it was noted that high temperature and low humidity was inductive to selfing.

Microfilm \$2.50; Xerox \$6.00. 123 pages.

THE EFFECT OF MODIFIED ATMOSPHERES AND VARIOUS TEMPERATURES DURING STORAGE ON THE RESPIRATION RATES, COLOR INDICES, AND KEEPING QUALITY OF BETTER TIMES ROSES.

(L. C. Card No. Mic 60-787)

Thomas Everett Pope, Ph.D.
The Ohio State University, 1959

Because of the highly perishable nature of many florist crops, such as the rose, it is difficult to maintain the quality of these products between the time of harvest and the time they reach the consumer. Although refrigeration has long been used to lengthen the life of cut flowers, there has been an accumulation of evidence which indicates that modified atmosphere storage may also be of practical value in this respect. These studies were undertaken to determine the effect of various pre-storage and storage treatments on the keeping quality of Better Times roses.

Color changes of rose petals, as measured with the Gardner Automatic Color Difference Meter, were studied. A study was made of the after-storage quality of Better Times roses as affected by pre-storage at 50° F. with stems in water for 0, 12, and 24 hours prior to storage in sealed packages at 40° F. The rate of respiration of rose flowers, stems with foliage, and flowering stems at 45° and 60° F. was studied. Roses were stored in normal air, in atmospheres enriched with up to 20 per cent carbon dioxide, and in atmospheres modified by decreasing the oxygen percentage. Storage temperatures of 30°, 32°, 37°, 40°, 42°, 50° F. and room temperature were used. Roses were packaged and stored under these atmospheric and temperature conditions for various lengths of time, and the effect of these storage conditions on the color indices, loss of fresh weight, rate of respiration, rate of opening and days of useful life after storage were studied.

The results of these experiments showed the following: There was a reduction in the amount of yellowness and redness and an increase in amount of lightness of the rose petals as the flower approached senescence and/or as the storage period was lengthened.

As the length of the pre-storage period was increased, there was a decrease in the amount of red color of the rose

flowers, but an increase in the number of roses opening after removal from storage.

A reduction in storage temperature resulted in a decrease in respiration rates. Flowers alone had a higher rate of respiration than stems with foliage, and the lowest rate was exhibited by the flowering stem. However, it was not possible to ascertain which part of a flowering stem accounted for the greatest amount of respiration. No positive climacteric rise in respiration was found, although a climacteric-like phenomenon was observed.

When roses were packaged in slightly modified atmospheres, there was no increase in the life of the flowers. More modified atmospheres produced undesirable effects, such as stem and petal necrosis, flaccid petals and necks, and bluing of the petals.

The rate of aerobic respiration was lower when the

oxygen concentration was reduced below atmospheric, and there was no great reduction in the rate of respiration as a result of the carbon dioxide concentration within the storage atmosphere.

The quality of Better Times roses cannot be ascertained by measuring the changes in flower color alone; visual observations are the best method of arriving at the acceptability on a quality basis.

It was found in these studies for the most satisfactory post-storage conditions of Better Times roses, they should be held at 50° F. with stems in water for 12 hours and then packaged in sealed cellothene bags in an atmosphere of normal air at 32° F. The storage period under these conditions should not exceed 12 days.

Microfilm \$2.50; Xerox \$6.80. 143 pages.

ANATOMY

THE IN VITRO-IN VIVO SCREENING OF DRUGS FOR, AND THEIR USE WITH, EXTRACORPOREAL REGIONAL CANCER CHEMOTHERAPY.

(L. C. Card No. Mic 60-471)

M. S. Mahaley, Jr., Ph.D.
Duke University, 1959

Supervisor: W. H. Knisely

The treatment of human cancers with drugs such as alkylating agents or amino acid analogs has been conducted in the past by the systemic administration of these drugs to patients. The toxic side effects of many drugs upon normal body tissues has limited the amount of drug that can be given during treatment. The need has arisen for a technique for isolating the tumor area to be treated, so that other sensitive tissues will not be exposed and higher concentrations of drugs can be used during treatment. This investigation concerns the development of a technique for localized intravascular perfusion of the head with blood containing chemotherapeutic agents and the screening and selection of drugs which would seem to be most applicable for this technique of regional chemotherapy.

The particles of two experimental cancers were exposed *in vitro*, for one to 24 hours, to various concentrations of chemotherapeutic agents; subsequent *in vivo* survival and growth of exposed particles in host animals were used to select the agents which were lethal to cancer cells following relatively short exposure periods. After establishing the toxic manifestations and the minimum lethal dose of each potential anti-cancer agent upon dogs, each drug was perfused regionally to the heads of other dogs, utilizing an extracorporeal cerebral blood circulation, to determine any toxic effects of drugs upon normal brain tissue and to measure, by means of an isotope added to the regional circulation, the collateral vascular leakage from the area of regional perfusion into the general body circulation.

The drugs included in this study were: methyl-bis(B-chloroethyl)amine (HN2); 2,5-diethylenimino-3,6-bis(2-

methoxyethoxy)-1,4-benzoquinone (A139); triethylene thiophosphoramidate (TSPA); 1,6-bis(2-chloroethylamino)-1,6-deoxy-D-mannitol dihydrochloride (BCM); triethylene melamine (TEM); N-3-oxapentamethylene-N',N''-diethylene thiophosphoramidate (OPSPA); 2H-1,3,2-oxazaphosphorine, 2-bis(2-chloroethyl)amino tetrahydro-2-oxide (Endoxan); meta-, ortho-, and para-fluorophenylalanine; B-2-thienylalanine; phenyllactic acid; dl-ethionine; and methionine sulfoxide. Results indicated that the most effective anti-cancer drugs following *in vitro* exposure periods of one to three hours were HN2, A139, TEM, TSPA, o-fluorophenylalanine, OPSPA, BCM, and perhaps thienylalanine and phenyllactic acid. The anti-cancer drug effect was diminished by exposing the tumor particles at 20° rather than 37° C. The perfusion of relatively large quantities of these agents to the heads of normal dogs was satisfactorily accomplished with no observed toxic effects upon cerebral tissues. Survival following head perfusion was predicated upon the magnitude of the leakage of toxic drugs through collateral vessels into the general body circulation and thus reaching sensitive tissues; death occurred only when the total leakage into the general body circulation was approximately equal to or greater than the minimum lethal dose.

It is concluded that several of the agents tested are effective anti-cancer substances against two experimental tumors following a relatively short *in vitro* exposure (one to three hours) of drug to tumor. Some drugs which have previously been used for systemic treatment of neoplasms do not seem to be as effective following short drug-tumor exposure. The more effective anti-cancer activity at 37° C. rather than at 20° C. was anticipated and suggests the consideration of hyperthermic chemotherapeutic perfusions at 40 to 42° C. When perfused regionally to the heads of normal dogs, these drugs do not appear to damage normal cerebral tissues. However, it is important to monitor the collateral vascular leakage of toxic drugs from the area of perfusion into the general body circulation, so that perfusion can be stopped before a lethal level of drug reaches the entire body. It is

anticipated that this technique of regional head perfusion can be adapted to the perfusion of the heads of patients with cerebral neoplasms. The data reported here will be used to select the drugs most effective as anti-cancer agents following a short exposure of experimental tumor to drug, as would be the case during a regional brain perfusion of one to three hours. None of the drugs tested thus far appears to damage normal dog brain tissue, whereas it is hoped that pathologic tumor tissue situated within the perfused brain will be differentially affected by drugs. Microfilm \$2.50; Xerox \$4.40. 83 pages.

**THE AUTORADIOGRAPHIC DISTRIBUTION OF
DL-CYSTINE-S-35 IN NORMAL AND
WATER-DEPRIVED ADULT RATS**

(L. C. Card No. Mic 60-476)

Joseph Wells, Ph.D.
Duke University, 1959

Supervisor: Joseph E. Markee

This study was designed to demonstrate the effects of water deprivation upon protein synthesis. Of particular interest was the protein synthesis associated with the supraoptic and paraventricular nuclei of the hypothalamus but the sites of synthesis were also noted in other organs. The supraoptic and paraventricular nuclei are involved in the synthesis of the so-called "neurosecretory material" which is a large, stainable protein that has been proposed as the vehicle of antidiuretic hormone (ADH) in the transit of ADH from the hypothalamus to the neurohypophysis. The cytological findings in states where an increased synthesis of the neurosecretory material can logically be expected (e.g., water deprivation) have varied and the evidences of an actual synthesis of the material were not clear.

It was hoped that the increased synthesis of the neurosecretory material could best be demonstrated by the use of radioactive isotopes and by recording the localization of the isotope on a photographic emulsion, i.e., by autoradiography.

Because the general autoradiographic localization of cystine had been done only on very young rats, it was felt necessary to note the normal distribution of cystine in adult rats before comparing it to the distribution found in the water-deprived animal.

Dl-cystine-S-35 was the isotope of choice because it is an indicator of protein formation and because there is more cystine than there is any other amino acid in the neurosecretory material. Five rats were deprived of water from 7-10 days which is the length of time necessary to deplete the neurohypophysis of its stainable neurosecretory material. Sixteen rats received a dose of 0.3 μ c/gm body weight and were sacrificed at 2, 4, 8, 12, 24, and 48 hours after the intraperitoneal administration of the isotope. Parts of the brain, hypophysis, adrenals, kidney, spleen, intestine, pancreas and liver were taken and processed histologically. One section of these tissues were exposed to the film unstained while the section adjacent to it was stained. The film was exposed to the radiation emitted from the unstained section by a "contact" technique which allowed both normal and water deprived animals to appear on the same film. The developed film was used as an overlay to localize the sites of radioactivity. The resolution of this method is low so that magnification no greater than 30X could be used.

The distribution of the isotope, indicating protein synthesis, is described and discussed. The areas displaying the greatest formation of new protein were the pancreas, the outer stripe of the outer zone of the kidney medulla, the white pulp of the spleen and the mucosal glands of the small intestine. Areas showing moderate protein formation were the tubules of the kidney cortex, the adrenal cortex, the red pulp of the spleen, the liver and the adenohypophysis. The brain, on the whole, showed a very low degree of synthesis of new protein. However, three areas within the brain--the intercolumnar tubercle, the choroid plexus, and the tuber cinereum--manifest a high degree of new protein formation. Migration of newly synthesized protein was seen in the mucosal glands of the intestine. The protein originally located in the mucosal glands had found its way to the tips of the villi at 48 hours after the injection of the isotope.

The effect of water deprivation was more prominent in certain areas. The outer stripe of the outer zone of the kidney medulla displayed a striking loss of protein synthesis while the adrenal medulla, supraoptic nucleus, paraventricular nucleus and preoptic area of the brain displayed a remarkable increase in protein synthesis. It is concluded, however, that the increased protein synthesis of the supraoptic and paraventricular nucleus is attributable to more than just the effect of the dehydration phase of water deprivation. It is also concluded that the preoptic area must be included in the anatomical sites that manifest a response to water deprivation.

Microfilm \$2.50; Xerox \$3.80. 69 pages.

ANTHROPOLOGY

KIN, CASTE, AND COMMUNITY IN A HIMALAYAN HILL VILLAGE.

(L. C. Card No. Mic 60-287)

Gerald Duane Berreman, Ph.D.
Cornell University, 1959

Sirkanda, the site of this community study, is a village of the lower Himalayas 125 miles north of Delhi, India, in the state of Uttar Pradesh. Its inhabitants share cultural affinities with other peoples of the lower Himalayas between western Kashmir and eastern Nepal, all of whom are known as Paharis ("of the mountains"), and all of whom speak dialects of the Indo-Aryan language group called Pahari. Paharis are culturally and historically associated with peoples of the plains of North India but they have long been relatively isolated and are now distinct.

Sirkanda is located in the Central Pahari sub-region, corresponding roughly to that part of the Himalayas which is in Uttar Pradesh, i.e., between the Jumna and Sarda rivers. It is reasonably representative of villages of this culture area, a region which has hitherto been unreported in the anthropological literature. This study describes and analyzes the functioning of kin, caste, and community ties in the context of the geographical, historical, and cultural setting of the village and depicts the contemporary economic, religious, and social life of its people. Comparisons are drawn between these people and their better-known neighbors of the Gangetic plain.

The people of Sirkanda, like most Paharis, are primarily agriculturalists who practice terrace cultivation on the dry and rugged hills they occupy, and who keep cattle. Low caste villagers are artisans.

The variety of Hinduism which they practice has less of what is often termed the "great tradition" of Hinduism than is common in many areas, but it shares much with village Hinduism elsewhere in North India. Household and village gods are more important than gods of the Hindu pantheon. Individual spiritual possession and animal sacrifice are more important than conventional Hindu forms of worship. There is little inter-caste difference in religious belief and practice. Recently there has been a trend by villagers of all caste levels to "Sanskritize" ritual in an effort to raise their status in the eyes of more orthodox Hindus.

Kinship ties are of first importance in social organization. The patrilocal extended family is the basic economic, religious, and social unit. Bride-price marriage, polygyny, divorce, and widow remarriage are prominent features of the marital relationship. Exogamous clans and endogamous castes are important social units.

Caste is an all-pervasive feature of social organization but it is more loosely defined than is usual in India. There is a primary dichotomy between high and low castes (Khasiyas and Doms, respectively) with less significant

subdivisions. High castes here, as elsewhere in India, have a strong vested interest in maintenance of the caste system. Low castes resent their inferior status but are helpless in view of their small numbers and dependent condition. Similarities between caste relations here and Negro-white relations in America are striking.

Community organization is informal but stable. There has been little emigration or desire to emigrate from the village. Beyond the community there have traditionally been close ties and frequent interaction over an area within a half-day's journey. Outside contacts have not been of a kind or quantity to seriously threaten community cohesion. Government development programs have been largely unsuccessful. This is attributable to several factors ranging from the closed nature of the society to poorly planned and executed programs. Outside contacts are increasing along with governmental pressure for incorporation into the national culture of Independent India. The Himalayan hill area and its people are important to India. Successful assimilation of Paharis will depend to a large extent upon action programs based on an understanding of their wants and predispositions.

Microfilm \$8.95; Xerox \$31.80. 706 pages.

THE INFLUENCE OF IDEOLOGY UPON CULTURE CHANGE: TWO TEST CASES.

(L. C. Card No. Mic 60-2)

Stephen Porter Dunn, Ph.D.
Columbia University, 1959

Two specific instances of culture change are examined with regard to the influence upon them of ideology. "Ideology" is defined as a system consisting of three elements: a systematized set of sentences, with no limitation on their subject matter, which prescribe norms for a given society and carry the basis of their own authority within them; a formally organized power-structure which both interprets and enforces the sentences; and a society which is subject to control by the power-structure.

The first case examined is that of the Mexican Indians during and immediately after the Spanish Conquest. The development of the cultural situation in Mexico at this time is shown to have been decisively modified by the concurrent influence of two ideologies--one administered by the Catholic Church, the other by the Spanish monarchy. The result of this influence was the formation of a hybrid "Indian-colonial" culture, incorporating both Spanish and aboriginal elements, which remained stable throughout the colonial period and for some time beyond it.

The second case, the treatment of which is based in part upon actual fieldwork, is that of the Roman Jews. It is shown that the influence of an ideology administered by

the Papacy resulted in the formation of a part-culture among the Jews of Rome, vestiges of which still persist. This part-culture has virtually no connection with the original culture imported by the Jews from Palestine--as this can be reconstructed from historical sources--but is on the contrary a new creation within the Christian environment and due to its influence in an ideological sense. The elements which comprise the part-culture--geographical localization, economic specialization, in-group feelings of certain specific types--are shown to correspond directly to the predictable results of various ideologically inspired measures put through by the Papacy over a period of several centuries.

On the basis of these two cases, it is suggested that ideology--which can in certain respects operate independently of other cultural forces--may under the right conditions exert a potent influence on culture change. It is further suggested that examples of culture change now proceeding in various parts of the world could profitably be examined from this point of view.

Microfilm \$4.10; Xerox \$14.40. 318 pages.

SPEECH VARIATION AND SOCIAL STRUCTURE IN A GROUP OF NORTH INDIAN VILLAGES

(L. C. Card No. Mic 60-39)

Lewis Levine, Ph.D.
Columbia University, 1959

This dissertation demonstrates a pattern of linguistic diversity existing among the castes of four Indian villages. These stand, close to one another, upon the plains of the western region of the state of Uttar Pradesh. The dissertation also demonstrates certain aspects of the social structure, from which the linguistic phenomena might be said to follow. The linguistic facts are these.

There exists, in Lohaban, one of the four villages studied, a minor, though significant speech division. Linguistically, the village may be divided into two groups: the Camārs, and the other castes. In this village, Camār speech is peculiar in possessing, as alternate forms, words made from the third person remote demonstrative stem /g-/, and from the imperfect participle stem /cant-/ of the verb 'to go'. A similar speech division cannot be asserted of nearby villages; in the three other villages studied, all castes use forms in /g-/. Thus, an examination of the areal distribution of these speech traits shows a single village, Lohaban, to be a member of two dialect areas, within the village the dialect division being social rather than geographical.

This pattern of diversity parallels, and perhaps follows from the following social structure. Within each village, all inhabitants feel themselves to be related to one another by a kind of fictional agnatic kinship. Similarly, villages contained within a radius of some two miles also feel themselves to be connected to one another, and by a bond expressed in terms of this kind of kinship. Within any village, each inhabitant's associational life lies largely within his own caste group. However, the fractions within each village are not autonomous caste groups; rather, with respect to any villager, the functional caste groups seem to be made up of fractions coming from the villages

related to his own. Thus a man's associational life includes his caste-fellows from nearby villages.

No two villages have exactly the same set of related villages, the number related to both being roughly proportional to the distance between them. Because the kinship relationships between proximate villages are indefinitely repetitive in this way, individuals can be thought of as standing upon an open grid, along which their connections with fellow caste men from neighboring villages are extended outward to the farthest limits of their jāṭis. This system of inter-village, intra-caste contacts may be amplified by structured and unstructured contacts among affinal relatives. Thus, there is regular linking of the caste groups of a village to respective groups of other villages. This the social structure which, perhaps, allows speech forms to diffuse across the countryside at different rates for different castes--an hypothesis accounting for the observed speech form distributions.

This dissertation is based upon ethnographic and linguistic materials collected by the author during two trips to India (1954-5, 1956-8) of a total duration of approximately three years. These materials were supplemented by references to the literature. The plan of the dissertation is as follows:

A phonemic analysis was presented of the variety of Braj Bhāṣā spoken in Lohaban. Speech forms restricted to single castes in this village were then presented. Next, by citing materials gathered in other villages, the distribution was traced of those forms restricted, in Lohaban, to Camārs. To provide ethnographic information for dealing with the linguistic problem thus displayed, a discussion was presented of the associational life of the individual with respect to his caste group and the other nexuses of social organization. To do this efficiently, a number of kin and caste terms were defined. Finally, the regular intervillage connections between corresponding caste groups were discussed. Also, there were included brief discussions of several papers concerned with social structure and language.

Microfilm \$2.50; Xerox \$8.40. 180 pages.

AN INQUIRY INTO THE PREFERENCE FOR PARALLEL COUSIN MARRIAGE AMONG THE CONTEMPORARY ARABS

(L. C. Card No. Mic 60-56)

Lucie Antoinette Wood, Ph.D.
Columbia University, 1959

This paper is a further inquiry into the preference for patrilineal parallel cousin marriage which is expressed by contemporary Arabs. It is an investigation of the marriage preference in relation to pastoral and peasant social organization. The lines of inquiry are how does the preference operate to structure social organization; how does it function at various levels of socio-economic complexity; and what kinds of interactional situations are conducive to the realization of this marriage preference.

The paper is based entirely on library research. The sources used include reports of travellers and sojourners in the Arabian peninsula as well as village studies of Arab peasant societies made by anthropologists, and more

general references pertaining to the economics, history, and sociology of the Arab world.

The thesis of the paper is that the preference functions to merge paternal and maternal lines of kinship, thus operating to produce highly cohesive patrilineal kin units and in so doing isolates these from other similar units. In pastoral society, these are linked together by loose genealogical reckoning through the concept of the shared descent of tribesmen. This concept is not operative in the village, and among the peasants the preference is more likely to be interpreted as meaning more distantly related kin. While among the pastoralists, it is the smaller patri-

lateral kin unit within which the marriage occurs, among the peasants it is the larger. Concerning the interpersonal relations conducive to this marital preference, it is suggested that there are differences in the patterns of interaction within the family among the peasants and pastoralists which are also directly implicated in the difference in degree of realization of the preference in the two kinds of society. The primary aim of the inquiry is to show how the preference structures groups at different levels of the society, and the society as a whole.

Microfilm \$2.50; Xerox \$7.20. 152 pages.

BACTERIOLOGY

ISOLATION AND BIOCHEMICAL STUDIES OF ASPOROGENIC MUTANTS OF BACILLUS CEREUS VAR. LACTICOLA

(L. C. Card No. Mic 60-378)

George Beskid, Ph.D.
Syracuse University, 1959

Supervisor: D. G. Lundgren

The purpose of this investigation was the isolation of stable asporogenic mutants (i.e. vegetative cells not forming spores) of the organism *Bacillus cereus* var. *lacticola* (A. T. C. C. #4342), utilizing the mutants as research tools for a study of the biochemical events leading to sporulation.

A minimal medium was developed for growth and sporulation of *B. cereus* in shaken flasks and on solid media. Parent spores were irradiated with ultraviolet light and plated on the minimal solid medium. A microscopic observation of stained smears of single clones was used as the screening procedure for the isolation of mutants which were completely vegetative and devoid of spores.

Chemical additions were made to the minimal medium in a search for growth factors or metabolites capable of supporting sporulation in the mutant cultures at 37C. Growth and sporulation patterns of normal and mutant cultures were studied at temperatures ranging from 28C to 37C. In an attempt to find clues contributing to the elucidation of the transition of the vegetative cell to the spore, pH measurements were made of the minimal medium during growth and sporulation of normal and mutant cultures at 28C and 37C. Changes in the minimal medium were studied during growth and sporulation of normal and mutant cultures at 28C and 37C. Components originally added to the medium were assayed along with specific metabolic by-products. Manometric studies were also made at 28C and 37C, comparing the enzyme patterns of vegetative cells of the mutants to the vegetative cells of the normal strain in respect to glucose oxidation.

"Active" culture techniques allowed sporulation to be studied free from growth. The glucose-glutamate-glycine-salts medium supported abundant growth and maximum

sporulation of the parent organism at 37C and 28C. Of the four mutants selected for extensive investigations, all failed to sporulate at 37C in the minimal medium, but growth was similar to the normal culture in three mutants. Mutant No. 107 exhibited a partial nutritional deficiency, and released a pink water-soluble pigment into the medium.

Complete reversal of the asporogenic to sporogenic character was not demonstrated in the chemical screening. Casein hydrolysate additions supported approximately 50 per cent sporulation in three of the mutant cultures. Some sporulation was also noted with particular low molecular weight protein derivatives added to the minimal medium. Mutant No. 107 failed to sporulate with any of the 130 chemical supplements screened. Mutants Nos. 40, 52 and 54 appeared to be temperature-sensitive, forming 90 per cent spores in the minimal medium at 28C, and no spores at 37C. The level of spore formation in the mutant cultures decreased progressively as the temperature increased from 28C to 37C. A more acidic environment developed externally during growth of the non-sporulating cultures than the sporulating cultures prior to the normal presporulation stages. This drop occurred at the same time that a morphological rearrangement was observed in the non-sporulating cells. The medium did revert to the basic state as the sporulating and non-sporulating cultures underwent normal and "abortive" sporulation respectively. The most significant observation of the chemical changes in the minimal medium showed that zinc was utilized by all sporulating cultures during both growth and sporulation, while non-sporulating mutant cultures used zinc only during growth and not during "abortive" sporulation. The vegetative cells of mutants Nos. 40, 52 and 54 contained an active glucose oxidizing enzyme system similar to that of normal vegetative cells.

Microfilm \$2.50; Xerox \$6.00. 121 pages.

AN EVALUATION OF FACTORS CONTRIBUTING TO THE RAPID DEATH OF BACTERIA IN SEA WATER

(L. C. Card No. Mic 59-3568)

Angelo Francis Carlucci, Ph.D.
Rutgers University, 1959

Major Professor: David Pramer

Great numbers of bacteria enter the sea by way of surface drainage and sewage outfalls but as one proceeds outward from land an extremely rapid decrease in the bacterial population is observed. The influence of various physical, chemical, and biological factors on the survival of *Escherichia coli* in sea water was investigated. For this purpose a procedure for the quantitative recovery of *E. coli* added to sea water was developed.

Cells of *E. coli* died more rapidly in deionized water than in 25 per cent sea water, but survival decreased as the concentration of sea water was increased above this level. Similar effects were observed when the influence of concentration of sea water on respiration was measured. Survival of *E. coli* in both sea water and NaCl solutions varied inversely with salt concentration, and a reaction of pH 5.0 was most favorable for survival. Survival was consistently greater in sea water than in NaCl solutions of equal pH and salinity.

The addition of nutrients to sea water decreased the rate of death of *E. coli* and in some cases, both the test organism and the indigenous microflora multiplied. Survival of *E. coli* in sea water supplemented with 0.1 ppm cysteine or thioglycollate was increased greatly.

The production of antibiotics active against *E. coli* was not demonstrated in tests of over 200 bacteria isolated from sea water. Chlortetracycline and penicillin were rapidly inactivated in sea water, whereas chloramphenicol, neomycin, oxytetracycline, and streptomycin persisted for 30 days. In general, antibiotics reduced the numbers of colonies developing on sea water agar and growth in sea water broth of both *E. coli* and the indigenous bacterial population of sea water. Nitrification and thiosulfate oxidation were more sensitive to antibiotics than was ammonification.

Although bacteriophages were readily isolated from sea water they did not significantly influence the survival of *E. coli* except in water supplemented with sufficient nutrient to permit bacterial growth. Coliphages were inactivated rapidly in natural sea water but persisted in sea water that was sterilized.

The bactericidal action of sea water was demonstrated by greater survival of *E. coli* in autoclaved than in untreated portions of water samples. The effect was most pronounced in water collected during spring and summer months but was induced in water collected in mid-winter by storage.

The survival of *E. coli* in untreated, filter sterilized, and heat sterilized portions of 6 water samples was determined. In 4 of the 6 experiments survival of the test organism was significantly greater in filtered than in untreated sea water, indicating that in these cases predation and competition were factors of importance. In 2 of the samples, predators and competitors appeared to be solely responsible for the bactericidal action since the survival of *E. coli* was the same in filtered and autoclaved water. In 2 other samples filtration had no influence and it

appeared unlikely that predation and competition contributed significantly to the bactericidal action of sea water. In 4 of the 6 samples, survival in autoclaved water was considerably greater than in filtered water suggesting that factors other than predation and competition contributed to the rapid death of *E. coli* in the untreated water.

The addition of nutrients to sea water overcame the bactericidal action but high concentrations were required and the effect did not persist.

E. coli was observed to die less rapidly in autoclaved than in untreated portions of artificial sea water. The magnitude of the bactericidal action of artificial sea water decreased with storage.

Microfilm \$2.50; Xerox \$6.60. 137 pages.

QUANTITATIVE STUDIES ON TOXOPLASMA BY PLAQUE ASSAY IN TISSUE CULTURE

(L. C. Card No. Mic 60-325)

Sotiros Demetrios Chaparas, Ph.D.
St. Louis University, 1959

Toxoplasma gondii is a pathogenic protozoon which can multiply only within host cells. These fastidious growth requirements have made it difficult in the past to do critical quantitative studies on the biology of the organism and its interaction with the host. The purpose of these studies has been to develop a method permitting reproducible and sensitive infectivity assays of *Toxoplasma* in an *in vitro* system.

It has been found that *Toxoplasma*, like many viruses, produces discrete necrotic lesions on monolayers of chick embryo fibroblasts overlaid with nutrient agar medium. Infectivity titrations by plaque assay have led to the following conclusions: (a) each plaque was induced by infection of a single cell by a single parasite; (b) in random samples assayed, the efficiency ranged from about 5 to 50 per cent, i.e., 1 out of 20 to 1 out of 2 parasites was capable of inducing plaque formation; (c) by proper manipulation of infected tissue cultures, *Toxoplasma* populations could be obtained at will in which 40 to 50 per cent of the organisms were infectious, i.e., plaque formers.

In attempts to standardize conditions which might produce maximal infectivity, the following results were obtained: (a) a variety of media with tissue extract, proteins and protein hydrolysates were tested for their ability to preserve infectivity of *Toxoplasma* and produce high efficiency of plating

$$(E.O.P. = \frac{\text{number of plaques produced} \times 100}{\text{number of organisms plated}}).$$

Balanced salt solution containing chick embryo extract in concentrations from 5 to 50 per cent came closest to meeting the favorable requirements for a suspending medium, in that undiminished infectivity was maintained for at least 3 hours. But even in this medium, over 90 per cent of the initial infectivity was lost within 24 hours. (b) Under the usual conditions of infection (organisms suspended in 0.5 ml of medium added to monolayers in a 50 mm Petri dish), 90 minutes exposure was found to be sufficient time for adsorption of maximum number of

plaque-forming parasites. The rate of adsorption was slow for the first 20 minutes, followed by a more rapid exponential phase with a velocity constant for adsorption of $K = 9.6 \times 10^{-10}$ toxoplasma adsorbed per cell per minute.

Two factors influenced the rate of adsorption: (a) increases in the sedimentation rate by centrifuging the plates during adsorption caused an increase in the adsorption rate, (b) increases in the viscosity of the medium caused a decrease in the adsorption rate.

With a multiplicity of infection 1.2×10^{-5} plaque-forming units (pfu) per cell, growth of *Toxoplasma* was exponential for at least 96 hours. During this period, the number of organisms increased 20,000-fold to a count of 6.8×10^6 parasites. With multiplicities of 1.2×10^{-3} and 1.2×10^{-1} pfu per cell a maximum of 5×10^7 toxoplasma were obtained from a single sheet within 72 and 24 hours, respectively. Under conditions of massive infection, the final yield in the entire monolayer did not exceed an average of two organisms per cell.

The plaque assay is in effect a viable count capable of defining the infectiousness of a single toxoplasma. With this tool, it should be possible to acquire information about the parasite that previously was not readily attainable.

Microfilm \$2.50; Xerox \$6.20. 129 pages.

ELECTRON MICROSCOPY OF ULTRA-THIN SECTIONS OF SCHIZOSACCHAROMYCES OCTOSPORUS

(L. C. Card No. Mic 60-599)

Samuel Francis Conti, Ph.D.
Cornell University, 1959

Cell division in *Schizosaccharomyces octosporus* was studied by means of ultrathin sectioning and electron microscopy. It was established that (1) Karyokinesis occurs well in advance of cytokinesis; (2) transverse cell wall formation occurs by the annular centripetal growth of an inner lateral portion of the cell wall; (3) the cytoplasmic membrane is closely associated with the cell wall throughout all stages of cytokinesis; (4) after initial formation, the transverse cell wall increases in thickness eventually splitting and completely separating the daughter cells; (5) electron dense membranes are formed which partition the transverse cell wall prior to its splitting, these membranes serving initially as the outer portion of the cell wall; (6) the nucleus is surrounded by a limiting membrane which remains intact during all the observed stages of nuclear and cytoplasmic division; (7) nuclear division can only be described as a process of elongation and constriction, further observations of chromatin behavior being beyond the scope of the techniques used; (8) internal membranes and cytoplasmic inclusions similar in structure to those found in other yeast are present. Behavior of other cytoplasmic inclusions during cell division is described, and cytokinesis in *Bacillus cereus* and *Sch. octosporus* compared.

Electron micrographs also illustrate the cytological changes occurring during plasmogamy, karyogamy, and subsequent nuclear division in *Sch. octosporus*. The conjugation process appears to be initiated by the attachment of the cells in pairs by a portion of the cell wall. Fusion

of cells by means of projection tubes was not observed. The central portion of the connecting cell wall then disintegrates, thereby forming a short, narrow conjugation canal which subsequently increases both in length and width. At this stage, the nuclei migrate toward one another and fuse within the canal. The limiting membranes remain intact except in the region of nuclear fusion. Subsequent nuclear division appears to occur by a process of constriction.

Observations on sporulation, ascospore structure, and germination also revealed that sporulation is initiated by the formation of a double ascospore membrane which encloses each nucleus. The inner portion of this membrane appears to serve as the structural precursor of the cytoplasmic membrane. The ascospore wall then develops around the ascospore membrane and gradually increases in width. Mature and germinating ascospores are surrounded by 2 spore coats, the inner one giving rise to the vegetative cell wall. Germination is initiated by swelling and elongation of the cells with subsequent disruption of the outer spore coat. At this stage vegetative cell division is initiated. Further evidence is presented to support the contention that the yeast vacuole is not an integral part of the nucleus. Ascosporeogenesis, ascospore structure, and germination of *Saccharomyces cerevisiae* and *Sch. octosporus* are compared.

Microfilm \$2.50; Xerox \$4.40. 82 pages.

A STUDY OF THE TERMINAL RESPIRATION OF THIOBACILLUS THIOPARUS

(L. C. Card No. Mic 60-535)

Robert Chauncey Cooper, Ph.D.
Michigan State University, 1958

Major Professor: W. L. Mallmann

A study has been made on the terminal respiration of *Thiobacillus thio-parus*. Whole cell suspensions showed some oxygen uptake in the presence of tricarboxylic acid cycle intermediates. This uptake appeared to be directly proportional to the endogenous rate. Unsupplemented cell free extracts demonstrated no activity against these organic intermediates.

Evidence has been presented for the presence of various enzymes of the tricarboxylic acid cycle. No direct evidence could be obtained for the presence of cis-aconitase or fumarase. Tests for the condensing enzyme, citrogenase, were inconclusive. Citrate was shown to be active in the metabolism of *T. thio-parus* but the actual mechanism involved in its formation was not clear. The enzyme, citratase, appeared to be absent.

From the results obtained it appears that *T. thio-parus* has a terminal respiration similar to that found in many heterotrophic microorganisms. This respiration is the same as or closely related to the conventional tricarboxylic acid cycle of Krebs.

Microfilm \$2.50; Xerox \$4.20. 76 pages.

**PHYSIOLOGY OF OXYTETRACYCLINE RESISTANT
AND SENSITIVE *STREPTOCOCCUS LACTIS***

(L. C. Card No. Mic 60-774)

Emil Michael Mikolajcik, Ph.D.
The Ohio State University, 1959

The problem of antibiotics in milk is of interest to the manufacturer of cultured dairy products, since such antibiotics will inhibit the growth of essential acid producing bacteria. Although *Streptococcus lactis* strains have been developed which will reproduce normally in milk containing high oxytetracycline concentrations (100 ppm.), with the development of resistance, there occurred a reduction in the acid producing ability of these strains.

The study was undertaken to ascertain the factors which account for such losses in acid production, with a view toward developing procedures which could either stimulate acid production of resistant cells or reduce the deleterious effect of oxytetracycline, thus affording susceptible starters an opportunity to produce acid at a desirable rate.

By the use of radioactive oxytetracycline with cell fractionating methods, it was found that the cell wall was the probable site of action of this antibiotic. Although both resistant and sensitive cells irreversibly bound oxytetracycline, the resistant cells bound more of the antibiotic under all experimental conditions.

Results indicate that the development of resistance has altered the cell wall and/or osmotic barrier of *Streptococcus lactis* 10D. The sensitive organisms were able to tolerate higher salt concentrations and stronger alkalinity than resistant cells. Electron microscopy of fixed cells and cell sections also revealed differences in structure. The resistant organism had a more rigid cell wall with a less electron dense internal mass, whereas sensitive cells had a more diffuse cell wall with more prominent electron dense cytoplasm.

Resistant cells had a more exacting requirement for anaerobiosis than sensitive cells as revealed by shake tubes. There was greater loss of acid production by resistant cells incubated in large flasks with mechanical shaking than by sensitive organisms similarly handled.

Metabolic differences between resistant and sensitive cells were observed by the use of paper and gas/liquid chromatography, with radioacetate serving as a tracer for certain of the experiments. Sensitive cells grown in medium containing oxytetracycline showed an accumulation of glutamic acid, leucines, acetone, and alanine. C^{14} -apartate acid and oxaloacetic acid accumulated in the medium of resistant cells. The importance of these acids as precursors of pyrimidines coupled with previously reported work could indicate a cause of reduced acid production by resistant cells, since uridine diphosphate is the co-enzyme for the conversion of galactose-1-phosphate to glucose-1-phosphate. Alpha-ketoglutaric acid also was shown to accumulate in the medium of resistant cells.

Based upon the observations made with cell wall binding of oxytetracycline, a procedure was developed by which this antibiotic in milk was inactivated, thus permitting sensitive starters to produce normal acidity. The procedure consisted in inoculating milk containing oxytetracycline with either packed resistant *S. lactis* 10D cells or 5 per cent active resistant *S. lactis* 10D starter; incubating for 30 minutes, thus allowing binding to occur;

and then culturing with sensitive starter. Following this procedure, the titratable acidity development approached and in certain cases surpassed that of the control lots.

Microfilm \$2.50; Xerox \$6.20. 127 pages.

**THE MECHANISM OF CARBON DIOXIDE FIXATION
BY THE ACID-FAST ORGANISM,
*MYCOBACTERIUM PHLEI***

(L. C. Card No. Mic 60-585)

Toshio Myoda, Ph.D.
Iowa State University of Science and Technology, 1959

Supervisor: C. H. Werkman

Because of the peculiarities of the mycobacteria, acid-fast bacteria, relatively little is known regarding their metabolism. The present study was undertaken to better understand the metabolism of *Mycobacterium phlei*, mainly carbon dioxide fixation using radioactive carbon 14. The necessity of carbon dioxide for the growth of acid-fast bacteria has been known for quite some time. The early studies, however, dealt with just bactericidal and inhibitory action, beneficial action and indispensability. Therefore the effect of carbon dioxide was investigated in connection with the metabolism.

Since the experiments involved synthesis of enzymes, a simple chemically defined medium was needed for comparison with a complex medium. For this purpose a medium containing Tween 80 as a single carbon source and ammonium chloride as a single nitrogen source was employed. The results indicated that *M. phlei* can grow in a simple medium as well as in a complex medium. The effect of Tween 80 on the submerged culture of *M. phlei* was found to be not only due to its wetting action but also to its action as a substrate. It was proved that the simple medium is suitable for comparative study.

The present study indicated the presence of the following enzymes in cell-free extracts obtained from cells grown in a complex medium: phosphoglucoisomerase, glucose-6-phosphate dehydrogenase, 6-phosphogluconate dehydrogenase, fructose-1, 6-diphosphatase, and aldolase. These dehydrogenases were found to be TPN-specific. 6-Phosphogluconate could not be oxidized by the extract in phosphate buffer but in veronal buffer. The inhibitory action of inorganic phosphates was observed.

The results indicated that the cell-free extracts obtained from cells grown in either a simple medium or a complex medium contain at least two carboxylating enzyme systems which catalyze the reaction between carbon dioxide and phosphoenolpyruvate to form oxalacetate. One is a nucleotide-independent system which is irreversible and similar to phosphoenolpyruvic carboxylase, and the other is a nucleotide-dependent system which is reversible and similar to oxalacetic carboxylase. Both systems require a divalent metal ion, such as Mn^{++} , Mg^{++} , or Co^{++} , for their activities. Inosine or guanosine polyphosphate has a marked effect on the latter type of fixation. The effect of the other nucleotides varies with the extract or with ion present. The participation of -SH groups in both systems was proved. The effect of reduced glutathione was significant with Mg^{++} . An addition of biotin

did not show significant effect. It was shown, however, that the addition of avidin inhibited slightly a nucleotide-independent system. The optimal conditions for these enzyme systems were investigated. And the role of these enzyme systems in the metabolism was discussed in connection with the Krebs' citric acid cycle. Attempts to demonstrate a carboxylating system of pentose phosphate and nucleoside diphosphokinase have been unsuccessful.

Microfilm \$2.50; Xerox \$7.20. 152 pages.

STUDIES ON THE CHEMOAUTOTROPHIC IRON BACTERIUM FERROBACILLUS FERROOXIDANS

(L. C. Card No. Mic 60-386)

Melvin Philip Silverman, Ph.D.
Syracuse University, 1959

Supervisor: Donald Lundgren

The objectives of this investigation were (a) the development of a synthetic inorganic medium capable of supporting the growth of large numbers of physiologically active cells of the obligate chemoautotrophic iron-oxidizing bacterium, *Ferrobacillus ferrooxidans*; (b) the development of a procedure permitting the harvest of cells free from precipitated iron; (c) an investigation of the autotrophic metabolism of this organism with particular emphasis on iron oxidation.

A nutritional study resulted in the development of a synthetic inorganic medium (9K), containing 9,000 ppm Fe^{++} , that increased growth from 7.0×10^6 cells per ml in the stationary phase of growth to 2.0 to 4.0×10^8 cells per ml in the logarithmic phase. A concentration of 9,000 ppm Fe^{++} was optimal for the most rapid growth rate; further increases, up to 30,000 ppm Fe^{++} , resulted in a progressive decrease in the growth rate, although total growth was comparable. Generation times averaged 7.8 hours at 24°C , and 7.0 hours at 28°C . No growth occurred at 37°C . *F. ferrooxidans* has an acidic optimum for growth; the pH of growing cultures decreased from initial readings of 3.0 to 3.6, to pH values of 2.3 to 2.6. Several attempts were made to control pH. The addition of Na_2CO_3 , $\text{Ca}_3(\text{PO}_4)_2$, or CaCO_3 , had little effect on growth. Citrate, citrate-phosphate, and phthalate buffers (pH 3.6) were toxic.

Good growth required efficient aeration; considerable differences were observed in both total growth and growth rates in shaken vs stationary culture. Neither a trace element solution (Mn, Cu, B, Zn, Mo, Co) nor the substitution of tap water for distilled water had any effect on growth. Increasing the phosphate concentration from 0.027 per cent to 0.15 per cent, or more, completely inhibited growth, as did the incorporation of 1.0 per cent metallic iron.

The optimum growth conditions determined in the nutritional study were translated to large scale culture. A harvesting procedure was devised that removed 40 to 65 per cent of the cells from most of the accompanying iron precipitate. Fifty ml washed cell suspensions were obtained containing as many as 2.6×10^{10} cells per ml.

The iron-oxidizing system was investigated in manometric studies using intact cells. No endogenous metab-

olism was ever observed. Iron (50 to 500 μM per Warburg vessel) was oxidized in accordance with the reaction



and at a very rapid rate; $Q_{\text{O}_2}(\text{N})$ values ($\mu\text{L O}_2$ uptake per mg total N per hour) ranged from 2027 to 5131. The optimum temperature and initial pH were 37°C , and pH 3.0 to 3.6, respectively. Citrate and p-toluene sulfonic acid buffers were strongly inhibitory; phosphate showed weak inhibition; Mn^{++} showed weak stimulation of iron oxidation. During the oxidation of 50 $\mu\text{M Fe}^{++}$, an average of $0.97 \pm 0.20 \mu\text{M CO}_2$ was assimilated; the mean free-energy efficiency was 20.5 ± 4.3 per cent.

Cell suspensions were unable to oxidize di- and tetravalent Mn, Co^{++} , Ni^{++} , thiosulfate, or ammonium ions. However, a slow but significant oxidation of elemental sulfur was observed. Preliminary experiments revealed that washed cells from 2 out of 3 different harvests were able to grow on sulfur after growth on iron; of these two, only one could be subcultured on sulfur, and neither showed any growth on iron after previous growth on sulfur.

From the following findings, it was concluded that *F. ferrooxidans* can grow chemoautotrophically at the expense of ferrous iron: (a) The rates of iron oxidation and cell growth were parallel; (b) growth ceased upon substrate exhaustion; (c) total growth was proportional to the ferrous iron concentration up to a level of 9,000 ppm; (d) a measurable quantity of CO_2 was assimilated during Fe^{++} oxidation; (e) iron was the only substrate oxidized at a rapid rate.

Microfilm \$2.50; Xerox \$6.60. 139 pages.

QUANTITATIVE DETERMINATION OF HEMAGGLUTININS FOR NORMAL AND TRYPSINIZED HUMAN RED BLOOD CELLS

(L. C. Card No. Mic 59-5369)

Henry Joseph Winn, Jr., Ph.D.
The Ohio State University, 1952

Prior to the elaboration of precise, quantitative, immunochemical techniques, little definitive knowledge existed regarding the mechanism of serologic reactions or the quantitative relationship between the intensity of the serologic reactions as described by the classic techniques and the extent of *in vivo* biological activity of antibody. Moreover, because of the end point of the serologic reactions involved a subjective measurement, techniques could not be standardized, and criteria for comparing different immunologic systems could not be established. There was, in fact, some question as to precisely what one measured by many of the earlier methods of antibody titration. Accordingly, it was impossible to investigate thoroughly the peculiar immunologic changes which are known to accompany certain minor physical or chemical modifications of naturally occurring antigens.

The development of analytical methods in serology has provided a technique for measuring antibody which meets the requirements of quantitative analytical chemistry and overcomes, in large measure, the objections found in the classical methods. However, most quantitative work has been restricted to studies on simple

systems involving relatively pure antigens, e.g., ovalbumin-antiovalbumin sera, pneumococcal capsular polysaccharide - anti-pneumococcal polysaccharide sera. The investigation of these simpler immunologic systems has clearly established the value of quantitative techniques. There remains now the task of applying these techniques to the more complex systems which are so often implicated in disease processes.

Quantitative methods have had limited use in hemagglutination studies because a suitable antigen has been lacking. The chief limitation of the quantitative agglutinin method is that method's dependence upon differences in nitrogen. Each value for agglutinin nitrogen involves two sets of nitrogen analyses. Since the nitrogen content of the antigen used is generally comparatively high, large errors will result when the amount of antibody nitrogen removed by a given amount of antigen nitrogen is but a small fraction of the total nitrogen. With intact erythrocytes the amount of antibody nitrogen removed is so small a fraction of the erythrocyte nitrogen that the method is impractical. By preparing stromata and eliminating the immunologically inert hemoglobin nitrogen, other workers have used the method with a moderate degree of precision in the study of rabbit anti-sheep hemolysins. However, there are no reports in the literature on the subject concerning the preparation of human erythrocyte stromata for such purpose. The present investigation establishes a procedure for preparing and using stromata of normal and trypsinized human red blood cells in quantitative hemagglutination studies.

Several investigators have shown that human red blood cells properly treated with trypsin exhibit striking serologic properties not possessed by untreated cells. The ability of such treated cells to agglutinate directly in saline dilutions of incomplete antibody is important in the diagnosis of acquired hemolytic anemia. However, despite the fact that trypsin modified cells serve to indicate the presence of hemagglutinins not otherwise directly detectable, no satisfactory explanation for their peculiar behavior has been advanced. Literature on the subject reveals that trypsinization is not accompanied by any significant change in the physical or morphological characteristics of the erythrocyte surface, nor is it likely that the process leads to any profound chemical alteration of the cell ultrastructure. Moreover, the modified serologic activity of treated cells suggests that there may exist antigenic differences between treated and untreated cells. Such slight differences as may be involved would be effectively investigated only by the application of precise quantitative techniques; the quantitative procedure elaborated in the present investigation has been employed for this purpose.

Immune sera were obtained from a group of rabbits immunized with normal human red blood cells and from a second group of animals immunized with cells previously treated with 0.1 per cent trypsin. Both types of sera were examined for hemagglutinins for treated and untreated cells before and after homologous and heterologous absorption. Titers for trypsinized cells were slightly higher than those for normal cells in unabsorbed sera of either type, and it was concluded that any specificity for homologous cells was masked by antibody specific for antigens common to both types of cells. Homologous absorption of either type of undiluted sera resulted in the simultaneous reduction of titers for both types of cells. Absorption of anti-Trbc sera with normal cells produced a serum frac-

tion which failed to agglutinate normal cells but had a titer of 1:512 for treated cells. Heterologous absorption of anti-Nrbc sera led to a marked reduction in the titer for treated cells whereas the titer for normal cells was only slightly reduced. Moreover, if anti-Nrbc sera were diluted 1:20 with saline and then absorbed with homologous antigen, a serum fraction was obtained which showed only trace agglutination for normal cells at a dilution of 1:20 but still leaving a titer of 1:320 for treated cells.

Although data obtained from serologic and absorption studies on these hemagglutinin systems have strongly indicated the existence of antigenic differences between normal and trypsinized human erythrocytes, little information has been obtained concerning the nature of these differences. Moreover, the differences obtained with absorption of diluted and undiluted antisera, and the patterns of successive homologous or heterologous absorption of either type of antisera suggest that the antigenic differences may be in part a reflection of the quantitative distribution of various antigens on both types of cells.

Initial quantitative determinations carried out in this investigation were based on the work of Heidelberger and Treffers.¹ Human erythrocyte stromata were prepared by lysis in distilled water followed by recovery of cell membranes in a Sharples centrifuge (40,000 r.p.m.) and several washings with water and saline. These stromata were investigated for their combining capacity in homologous and heterologous antisera at pH 7.4. The results of these experiments served also as a means of following the course of hemagglutination as a function of the amount of antigen added. For the homologous system, normal stromata and anti-Nrbc sera, an empirical equation has been derived similar to that found by other workers studying less complex systems. The combining ratio of normal stromata in anti-Trbc sera do not lend themselves to any simple mathematical treatment.

Although the data obtained in these experiments showed a moderate degree of precision, they were considered unreliable as indices of total antibody nitrogen since saline controls indicated that the stromata were significantly soluble at pH 7.4.

Attempts to prepare stromata which would be more satisfactory for quantitative work have been carried out. Stromata have been prepared from normal cells and from cells previously treated with trypsin. Liquid nitrogen, distilled water and mechanical disintegration using a Waring Blendor have been employed to effect separation of hemoglobin from cell membranes which were subsequently subjected to a variety of washing procedures in which temperature, pH, and salt concentration were controlled. Stromata prepared by the various methods were subjected to washing with 0.85 per cent saline. The procedure resulted in considerable fragmentation of membranes with the subsequent loss of a non-sedimentable protein component. The use of distilled water at pH 5.0 to 5.5 for lysis and washing procedures reduced considerably the fragmentation and loss of protein, and by alternately dispersing stromata at pH 4.0 to 4.5 and reprecipitating at pH 5.5 a pale brown product was obtained which consisted of a mixture of intact membranes and finely divided fragments.

Solubility of this stroma preparation was determined in 0.85 per cent saline and in normal rabbit serum buffered at various hydrogen ion concentrations from pH 5.0 to 7.4. Solubility was minimal and practically identical

in both media at pH 5.5. Hemagglutination titers of both rabbit antisera were redetermined at this pH; these titers did not differ significantly from those obtained at pH 7.4.

Quantitative estimations of total antibody nitrogen were carried out at pH 5.5 involving homologous and heterologous absorption of both antisera. Results paralleled in many ways those obtained in routine absorption studies.

Complete removal of antibody is extremely difficult especially in anti-Nrbc sera. Practically all antibody in anti-Trbc sera was removed with two homologous absorptions of approximately 0.5 mg. of stroma N, and although less antibody was removed from this same sera with stromata from normal cells, there was apparently little antibody for this type of cell remaining in the final supernate.

Results of quantitative studies failed to show any correlation between the absolute amounts of antibody nitrogen removed by stromata from either antisera and the serum dilution titer of the antisera. It appears, therefore, that the agglutination of either type of cell is not dependent on

the amount of absorbed globulin but is more likely related to the nature of the globulin molecules absorbed.

Results obtained by classical methods and quantitative determinations support the idea that in vivo destruction of foreign cells results in the production of antibodies first to surface components and subsequently to combinations of surface components and sub-surface structures. The latter type antibody appears to occupy a position on normal cells which prevents simultaneous reaction with more than one cell, thus sensitizing but not agglutinating these cells. This same antibody, because of its specificity being directed partially toward sub-surface components, can act as divalent antibody for cells partially degraded by *in vitro* trypsinization.

Microfilm \$2.50; Xerox \$4.40. 85 pages.

1. Heidelberger, M., and Treffers, H. P. "Quantitative Chemical Studies on Hemolysin. I. The Estimation of Total Antibody in Antisera to Sheep Erythrocytes and Stromata," *J. Gen. Physiol.*, 25 (1942), p. 523.

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BIOGRAPHY

RICHARD HARDING DAVIS: THE DEVELOPMENT OF A JOURNALIST.

(L. C. Card No. Mic 60-690)

Scott Compton Osborn, Ph.D.
University of Kentucky, 1953

Supervisor: Grant C. Knight

To name Richard Harding Davis today is even yet to evoke the image of a poised, immaculately dressed aristocrat of the press, a gallant knight of the pen. Behind the facade of the idealized image lies the true Davis, a personality of some importance in the quarter century between 1890 and World War I. A Philadelphian of good family, he reflected the Quaker City's aristocratic and Anglophile tendencies. The son of L. Clarke Davis and Rebecca Harding Davis, both writers and vigorous humanitarians, he emulated them in attacking social, political, and economic evils and in presenting acceptable patterns of conduct for his readers.

As a working reporter on daily newspapers in Philadelphia and New York from 1886 to 1891, as managing editor of *Harper's Weekly* from 1891 to 1893, and subsequently as special correspondent, Davis put the imprint of his personality upon his writing and exercised considerable influence upon the point of view and style of contemporary American journalism. Always seeking the novel, the theatrically spectacular, the humorous, and the pathetic, he tried in his accounts, such as those of the Johnstown Flood in 1889, the coronation of Czar Nicholas II in 1896, the Progressive convention of 1912, to thrill, startle, and amuse his audience.

Davis brought a new manner to travel-writing. Whether in the American South (1885), Cuba (1886), England (1889, 1892), the American West (1892), the Mediterranean (1893), Paris (1893), Latin America (1895), or Africa (1893, 1900, 1907), he emphasized travel as personal adventure and looked for the same values as in his newspaper work. Travel also provided material for fiction and training for possible diplomatic service. His work in this genre was influential both in causing others to regard travel as an occasion for personal adventure and "discoveries" and in persuading young writers such as Frank Norris, Stephen Crane, and Sinclair Lewis that a prerequisite for the writer was experience in exotic lands.

Among newspapermen of the 1890's the highest caste was that of war correspondent, who watched men exhibit the most dramatic emotions, who saw history in the making, and who might himself influence the course of history. Interested in war from his earliest years, Davis was further stimulated by the writings of Rudyard Kipling. Though a late starter, he covered many wars: the Cuban (1897), the Greco-Turkish (1897), the Spanish-American (1898), the Boer (1900), the Russo-Japanese (1904), World War I (1914-16), and minor disturbances in Latin America. In reporting war as in his other work, Davis emphasized personal adventure, spectacle, human interest, and heroism. To Davis war, though a relic of barbarism, was the supreme adventure, and in it he found at their most intense value the thrills he had experienced in less degree on the playing field and in the theatre.

In his gaiety, his flippancy, his dandyish emphasis on good form, his jingoism, his strenuousness, his youthful simplicity, his humanitarianism, his moral and political probity, his "muscular Christianity," Davis is the abstract

and brief chronicle of certain aspects of his time. Though he remained immature and though he did not achieve greatly, he was a graphic descriptive writer and he exercised a powerful influence in drawing others to journalistic work and in determining their point of view.

Microfilm \$9.10; Xerox \$32.35. 718 pages.

WINSTON CHURCHILL, AMERICAN:
A CRITICAL BIOGRAPHY.

(L. C. Card No. Mic 60-527)

Warren Irving Titus, Ph.D.
New York University, 1957

Adviser: Oscar Cargill

Winston Churchill, American, had a career as novelist, playwright, politician, and lay preacher. Born in 1871, three years before his illustrious English contemporary, he captivated his reading audience for two decades and then dropped out of the public eye, leaving behind a legacy of recorded segments of the Progressive Era in American life.

Orphaned as an infant, Churchill was brought up in the city of his birth, St. Louis, by an aunt and uncle. After graduation from Smith Academy, he won appointment to the U.S. Naval Academy in Annapolis, where he made an outstanding record as a student and athlete. Disliking the naval service, however, he decided to enter journalism. After brief periods of employment with the Army and Navy Journal and the Cosmopolitan magazine, Churchill devoted his full efforts to writing popular novels. With an accumulation of wealth acquired through marriage and, very soon, through the sale of his best-selling books, he retired to Cornish, New Hampshire, where he built and maintained a lavish estate, Harlakenden House. For twenty years, he lived the life of an English squire, writing a new novel every two years and concerning himself with New Hampshire and national progressive politics and contemporary social problems. Following a severe illness during the First World War, he retired from the world of authorship and spent the last thirty years of his life in comparative obscurity. He died in Winter Park, Florida, in 1947.

After publishing a minor social satire, The Celebrity, Churchill won his first fame in the field of historical romance. Richard Carvel, The Crisis, and The Crossing relate him to the renaissance of historical fiction that took place in the last years of the nineteenth century and the early years of the twentieth. Behind Churchill's great popularity was a desire to educate Americans in the

forces and ideals of the nation's background. Using a Thackeray-like style and employing prodigious research in the accumulation of data, Churchill tried to awaken his readers to the necessity for carrying on in the traditions of the forefathers. From his earliest successes, his purpose was didactic.

Following a brief career in New Hampshire politics, in which he served two terms in the legislature and very nearly captured the Republican nomination for governor in 1906, Churchill wrote two highly successful political novels that are representative of the first phase of progressivism. Like his friend, Theodore Roosevelt, Churchill urged a return to the basic ideals of the founding fathers as the solution of the nation's ills. By removing dishonest men from office and substituting dedicated public servants with the idealism of the early years of the republic, Churchill felt the answer to all the nation's problems could be found. In both Coniston and Mr. Crewe's Career, his solution was a moral one.

As national progressivism changed in tone after 1908, so did Churchill's fictional message. In A Modern Chronicle he investigated the problems of divorce, the position of the "new woman" in American society, and the business mania. The Inside of the Cup, which almost achieved the immense popularity of the earlier historical novels, dealt with the social gospel. In A Far Country, The Dwelling-Place of Light, and Dr. Jonathan, he concerned himself with labor and industrial questions. These later works revealed more sweeping indictments of American society and a recognition that the earlier moral solution would not suffice. Although Churchill was never certain of the direction a solution should take, he did see the need for more drastic change in the American system itself after 1908. The problem novels of Churchill's last phase reflect the themes of the Progressive Party of 1912 and foreshadow the proletarian fiction of the 1930's.

Churchill abandoned his highly successful career because of the general breakdown of progressivism after the First World War, because of the changing nature of literary techniques that outmoded genteel romanticism, and, more particularly, because of his own illness. He devoted his last years to a study of religious matters that, oddly enough, resulted in a repudiation of all his earlier efforts at reform propaganda.

Never a deep or original thinker, never a leader, Churchill was a man of high ideals and integrity who was representative of dominant middle-class thought: Eight of his ten novels stood among the top best sellers between 1899 and 1918. That this tremendous popularity made the author a millionaire is not as important as that it made him the mirror of taste for the eighteen years of the progressive ferment. It is here that his value lies today.

Microfilm \$6.80; Xerox \$24.10. 533 pages.

STUDIES ON THE EXPRESSION OF VARIOUS SINGED ALLELES IN *DROSOPHILA MELANOGASTER*

(L. C. Card No. Mic 60-421)

Harvey Alan Bender, Ph.D.
Northwestern University, 1959

Adviser: Robert C. King

1. Fourteen singed stocks were examined with respect to bristle and hair morphology, and fertility. These stocks could be subdivided into four categories: (1) sterile, with kinky hairs and gnarled bristles - sn^1 , sn^5 , sn^{50k} , sn^1sn^2 , sn^1sn^3 , sn^1sn^4 , sn^2sn^3 , sn^{x2} , and sn^c ; (2) fertile, with kinky bristles only - sn^2 , sn^4 , and sn^{34e} ; (3) fertile, with kinky hairs and gnarled bristles - sn^3 ; and (4) sterile, with gnarled bristles only - sn^{36a} .

2. Two major categories could be recognized on the basis of a study of oogenesis in the sn mutants. These categories are: I. normal oogenesis: fertile, and II. abnormal oogenesis: infertile. Oogenesis in all fertile sn mutants appears to be identical with the wild type. The sterile category can be sub-divided into IIa and IIb. Class IIa is represented only by the sn^{36a} mutant. Class IIb contains all of the sterile sn mutants studied except sn^{36a} . Cytological evidence suggests that vitellogenesis is retarded in ovaries of the sterile singed mutants, whereas pre-yolk chambers develop normally. Vitellogenesis appears more drastically retarded in the IIa group. Studies of the stage distribution of developing chambers in 156-hour sn^{36a} and sn^1 flies and comparative values for the volume of yolk cytoplasm produced by these two groups once again indicate that vitellogenesis is more drastically affected in the IIa group. Studies of stage distribution as a function of age in the IIa group and in wild type flies showed that the rate of vitellogenesis in the IIa group is markedly decreased and that oogenesis is never brought to completion.

3. Crosses were made in all permutations between representatives of the four classes of mutants in the singed complex. The findings are as follows: (1) to have gnarled bristles and kinky hairs, an individual must have a class 3 allele on one chromosome and a class 1 allele or class 3 allele on the homologous chromosome, or be homozygous for the class 1 allele. (2) to have gnarled bristles and wild type hairs an individual must have a class 4 allele on one chromosome and a class 1, class 3, or class 4 allele on a homologous chromosome. (3) to have kinky bristles and wild type hairs an individual must have a class 2 allele on one chromosome and a class 2, 3, or 4 allele on the homologous chromosome. (4) to be fertile, an individual must have wild type alleles at the class 1, class 2, and class 4 loci on one chromosome or at the class 1, class 3, and 4 loci on one chromosome.

4. The effect of addition of excess RNA to the food consumed by the sn^{36a} mutants was investigated. The experiments fell into two categories: (1) those in which

adults were fed (from eclosion) on supplemented medium and (2) those in which flies were fed on supplemented medium during both larval and adult stages. Supplementation of the medium by RNA in the concentrations used produced a general retardation in growth. The characteristic ovarian abnormalities of the sn^{36a} mutant were neither corrected nor intensified. Differences in the nucleic acid metabolism between larvae heterozygous and homozygous for this mutant were suggested.

A model is described which attempts to explain the action of this complex locus upon fertility and upon bristle and hair morphology. This model contains three loci, all portions of which deal with bristle-hair development. Two of the loci are in turn divided into sub-loci: the first, concerned with bristle-hair morphology; the second, with fertility. Microfilm \$2.50; Xerox \$4.60. 88 pages.

ENVIRONMENTAL AND GENETIC INFLUENCES UPON HEPATIC AND PLASMA VITAMIN A AND CAROTENE LEVELS IN RANGE CATTLE

(L. C. Card No. Mic 60-480)

Richard Harlan Diven, Ph.D.
University of Arizona, 1960

Supervisor: Carl B. Roubicek

Vitamin A and carotene levels were determined in liver and plasma sampled from a large number of purebred Hereford calves at approximately 8, 12, 18, and 24 months of age. Age variation (three months) among calves born in the same herd in a single year did not influence the amounts of vitamin A and carotene in the liver or blood of cattle from the time they were weaned until they were two years of age. Hepatic vitamin A, plasma vitamin A, and plasma carotene levels increased in cattle from eight months to two years of age. Hepatic carotene contents rose between eight and twelve months of age but no increase was observed between eighteen and twenty-four months of age.

Sex did not influence the relative levels of hepatic and plasma vitamin A and carotene consistently from one season of the year or one age group to the next. The variables did not appear to be influenced by the age of the dam when the calves were weaned (eight months of age).

In general, the magnitude of the increases and decreases in hepatic vitamin A content between sequential sampling periods was influenced by the initial vitamin A content. During periods of depletion those animals that had the greatest hepatic stores of vitamin A lost the most vitamin A by the next sampling period. The initial content of hepatic vitamin A also influenced hepatic vitamin A storage during repletion periods but not consistently in magnitude or sign.

The hepatic vitamin A and carotene contents and plasma carotene levels appeared to be heritable but the magnitude of the heritability coefficients varied considerably with age, sex, and season. The heritability of plasma vitamin A was not conclusive.

The degree of association between the variables was estimated by computing correlation and regression coefficients. Positive relationships were found to exist between hepatic vitamin A and hepatic carotene, hepatic vitamin A and plasma carotene, hepatic carotene and plasma vitamin A, and plasma vitamin A and plasma carotene. Relationships between hepatic and plasma vitamin A and between hepatic carotene and plasma vitamin A were not obvious.

Microfilm \$2.50; Xerox \$3.80. 67 pages.

GENETIC ANALYSIS OF COLCHICINE-INDUCED DIPLOID MUTANTS IN SORGHUM

(L. C. Card No. Mic 59-848)

A. Earl Foster, Ph.D.
South Dakota State College, 1958

In order to determine the nature of the inheritance of colchicine-induced mutations in a mutant derived by colchicine treatment from the sorghum variety Experimental 3, a true-breeding mutant P15 was crossed with its full sib P6 and F_2 and F_3 progenies were studied. Estimates of the number of genes which affected the expression of six different characters that had been mutated by colchicine treatment were obtained. The characters studied were days to heading, plant height, width of leaf, number of tillers, seedling base color, and awn development. The estimated number of mutated genes for each of the six characters is listed below.

Days to heading	5 or 6
Plant height	3
Width of leaf	at least 1
Number of tillers	at least 1
Seedling base color	1
Awn development	1

In order to compare the colchicine-induced mutation for strong-awns with an irradiation-induced mutation for the same character, the colchicine mutant P15 was crossed with an awned segregate obtained after irradiation of Experimental 3. The F_1 plants were all strong-awned and their progeny did not exhibit transgressive segregation. The colchicine mutant was also crossed with 39 - 30 - S, a strong-awned ancestor of Experimental 3. Again the F_1 plants were all strong-awned and no transgressive segregation occurred. This evidence indicates that the gene for awn development may be the same in the three lines of material.

Colchicine treatment of a plant of the variety Experimental 3 caused at least twelve (in all probability more) immediate mutations for the characters studied. It is concluded on the basis of this and earlier work that these mutations are inherited in a manner indicating that they are of the nature of point mutations.

Microfilm \$2.50; Xerox \$4.00. 73 pages.

USE OF THE POLYALLEL MATING SYSTEM TO MEASURE HERITABILITIES AND GENE INTERACTIONS IN POULTRY

(L. C. Card No. Mic 60-742)

Billy Lee Goodman, Ph.D.
The Ohio State University, 1959

A knowledge of the magnitude of additive and non-additive genetic variance is necessary to carry on an efficient breeding program. The polyallel mating system appears best suited to obtain reliable estimates of the additive and non-additive genetic effects. The number of progeny per sire-dam combination to give reliable estimates needs to be known.

Polyallel matings were used to produce chicks from a randombred broiler strain. Data collected on these chicks included the following: egg production to 46 weeks of age; egg weight, egg shape index and albumen height at 30 and 40 weeks of age; and bursa and spleen weight of day-old chicks. In addition, eight-week body weights were obtained from chicks produced from polyallel matings in two closed flocks under selection for improvement in growth rate.

The above data were analyzed by the analysis of variance technique to obtain estimates of genetic parameters.

Heritabilities from duplicate diallel sets for eight-week body weights from two closed-flock strains were inconsistent for male progeny, whereas the repeatability of estimates from the female progeny was remarkably good. This difference in response may be due to sex-linked genes. The heritabilities from 50 duplicate (four chicks per mating) diallel sets closely approximated those obtained from 150 diallel sets with two chicks per mating. Diallel sets with four chicks per mating appear to be superior for estimating additive and non-additive genetic effects.

There was little evidence of non-additive genetic effects on growth rate; however, there was consistent evidence of maternal effects among female progeny.

The data for survivors' egg production to 46 weeks of age indicated that the additive genetic effects were about 0.17. Dominance and epistasis were absent in this randombred population. Some sex-linked gene effects were indicated.

Additive genetic effects on egg weight were between 0.40 and 0.50. An estimate of the additive genetic effects on egg weight at the beginning of the laying period appears to predict accurately the heritabilities at older ages.

Non-additive genetic effects on egg weight appear to be unimportant. Sex-linkage was estimated to account for 0.17 and 0.43 of the total genetic variance.

The additive genetic effects on egg shape index ranged from 0.10 to 0.35. The data were not conclusive with regard to the non-additive genetic effects. Sex-linkage was indirectly indicated for egg shape at 30 and 40 weeks of age.

There was evidence of definite genetic effects on albumen height. Apparently non-additive genetic effects were present. Unexplained inconsistencies between the various heritabilities prevented any definite conclusions regarding the relative magnitude of additive and non-additive genetic effects.

The magnitude of S, D, and Q components for spleen

and bursa weights of day-old chicks remained approximately the same, whereas the I component decreased as the number of chicks per mating increased. It would appear that the increased number of chicks per sire-dam combination in diallel and triallel sets lowers the numerical value of I.

The confidence intervals for bursa and spleen weights were reduced to less than one-half by increasing the number of progeny from two to four per mating. Only a slight reduction occurred when the number was again doubled (from four to eight progeny). Four chicks per mating appear to be the maximum desirable number for estimating heritabilities.

As judged by the confidence intervals of the genetic components, diallel sets appear more efficient than triallel sets in estimating the additive and non-additive genetic effects in a population.

Microfilm \$2.50; Xerox \$5.60. 113 pages.

STUDIES ON THE TAXONOMY, MORPHOLOGY AND REPRODUCTION OF *PODOPHYA COLLINI* ROOT.

(L. C. Card No. Mic 60-435)

Antoinette Picciano Hastings, Ph.D.
Northwestern University, 1959

Adviser: Robert W. Hull

The present study of the suctorian, *Podophrya collini* Root was undertaken to clarify the conflicting arguments regarding its taxonomic position, its method of asexual reproduction and its type of conjugation. A detailed analysis of budding and of the implications, role and mechanisms of conjugation in this species in particular and in Suctorina in general are presented.

On the basis of evidence from previous studies and from observations underlying the present study, it is concluded that *Podophrya collini* as defined and described by Root (1914) should remain as a genus and species of the Family Podophryidae.

The normal life cycle of *P. collini* involves asexual reproduction by "semi-internal" budding with the production of ciliated, free-swimming buds. Upon metamorphosis, the buds assume typical adult morphology.

Infraciliary granules are randomly distributed in the pellicle of adult *P. collini*; in the bud double granules are oriented in rows at its anterior and posterior ends. Orientation and multiplication of these granules in the adult mark the initiation of budding. Pellicular proliferation and invagination, requisite of the type of budding in *P. collini*, appears to be controlled by the infraciliary granules.

During this study, neither encystment nor transformation of an adult into a bud occurred at any stage in the life cycle of *P. collini*.

Conjugation is a normal phenomenon at some point in the life of *P. collini*. The sexual process typically involves total fusion into a "synconjugant" of two morphologically similar (isogamous) suctorians.

Microfilm \$2.50; Xerox \$4.00. 71 pages.

THE EFFECTS OF ESTRADIOL-17B ON CLEAVAGE, NUCLEIC ACID METABOLISM, AND PROTEIN SYNTHESIS IN EMBRYOS OF THE SEA URCHIN, *STRONGYLOCENTROTUS PURPURATUS*.

(L. C. Card No. Mic 60-393)

Weldon Bosen Jolley, Ph.D.
University of Southern California, 1959

Cochairmen: Professors Martin and Thomas

Estrogenic substances have been shown to have a very widespread distribution. Although it is not known whether all of the substances isolated act as hormones, workers have shown estrogenic substances in extracts made from protozoans, coelenterates, worms, molluscs, crustaceans, insects, and echinoderms.

Estradiol-17B has been shown to inhibit cleavage in many embryos. However, the mechanism by which the inhibition occurs is not understood. Therefore, the primary purpose of this research was to determine the effects of estradiol-17B on cleavage, nucleic acid metabolism, and protein synthesis in sea urchin embryos. It was hoped that additional information might be obtained which would explain some of the carcinogenic and carcinostatic properties of this hormone.

Embryos were cultured in sea water containing estradiol and glycine-1-C¹⁴ or glycine-2-C¹⁴. The incorporation of radioactivity into DNA (deoxyribonucleic acid) and RNA (ribonucleic acid) adenine and guanine was determined, and the results were compared with those obtained from control embryos cultured only in the presence of isotopic glycine.

Microscopic examination showed that cleavage in the estradiol-treated embryos was delayed. During the first four cleavages, incomplete cleavage furrows were easily discernible in the estradiol-treated embryos. Furthermore, there seemed to be a large number of unequal cells formed. In later stages, the treated embryos showed a marked separation of the individual blastomeres.

Although the amount of RNA was not significantly changed, the DNA concentration was decreased in the estradiol-treated embryos. However, the experimental embryos had undergone fewer cleavages than the control embryos. The difference between the amount of DNA in the control and experimental embryos might be due to this factor.

A comparison of the incorporation of radioactivity from glycine-1-C¹⁴ and glycine-2-C¹⁴ into the nucleic acid adenine and guanine indicated that estradiol stimulated the utilization of one-carbon fragments.

Adenosinetriphosphate relieved the inhibition of cleavage in the estradiol-treated embryos. Moreover, adenosinetriphosphate increased the total amount of DNA present.

A comparative study on the effects of estradiol- and testosterone-treated embryos showed that testosterone did not delay cleavage. Furthermore, the concentration of DNA in the testosterone-treated embryos exceeded the amount of DNA in the control and estradiol-treated embryos.

The results of a preliminary study were reported in which it was shown that synchronization of cleavage of sea urchin embryos was increased by keeping the embryos

at five degrees centigrade for nine hours prior to the culture period. A change in absorption spectrum of the acid soluble fraction was observed. It was proposed that the change in the relative concentrations of the various components of the acid soluble material might reflect preliminary synthesis necessary for the formation of DNA which would allow cleavage to occur very rapidly when the temperature was raised to thirteen degrees centigrade. It was shown that the embryos remained viable after exposure to the reduced temperature for twenty-four hours.

Microfilm \$2.50; Xerox \$4.20. 80 pages.

A CYTOGENETIC STUDY OF ASYNAPSIS IN TOMATO (*LYCOPERSICON ESCULENTUM* MILL.)

(L. C. Card No. Mic 60-757)

Het Ram Kalia, Ph.D.
The Ohio State University, 1959

Unfruitfulness in a plant of the tomato variety Marglobe was shown by pollen mother cell studies to be associated with meiotic asynapsis. To investigate the nature of this asynapsis, fruit was set on the unfruitful plant by using pollen from an inbred woolly strain, also carrying the recessive marker genes *bk*, *c*, *j*, *t*, *u*, and *y*; and also by using pollen from Walter-15 which is immune to one strain of tobacco mosaic virus.

Some of the F_1 and F_2 progenies were grown in the field during the summer of 1958 at the Ohio Agricultural Experiment Station and some of the F_1 , F_2 , and all backcross and F_3 progenies were grown in the vegetable and genetics greenhouses at Columbus during the winter and spring of 1959. The plants in the field and in the greenhouses received the standard cultural care. In the greenhouses the plants were pruned to single stem and supported by jute twine. As for weather, the summer rainfall was considerably above normal and the light conditions in the greenhouses were above normal. The PMC smears were made in aceto-carmin and made permanent in diaphane.

A total of 1,033 plants were used in this study.

The frequency of asynaptic plants in F_2 was low and asynapsis did not appear to be controlled by a single recessive gene. The intensity of asynapsis was also variable, affecting one to six pairs of chromosomes. Although the F_2 data fit closely inheritance by two recessive genes, the F_3 progeny raised from a selfed asynaptic F_2 plant contained only a few asynaptic plants, again showing variable intensity of asynapsis. This suggests that the gene(s) responsible for asynapsis have incomplete penetrance and possibly modifiers.

The genetic interference in the segregation of *j* in F_2 , by means of reciprocal backcrosses, was thought to be due to the microsporic lethal gene *x* linked with *j* in the linkage group V. The map distance between *x* and *j* was found from the backcross data to be 7.2 units.

Recombination values for various loci involved in this study were calculated from both F_2 and backcross data.

In the F_1 progeny of both crosses aneuploids appeared, primarily trisomics, of diverse morphology and fertility. This indicates that asynapsis was also operative in megasporocytes and that asynapsis was affecting all the pairs

of chromosomes in a general way instead of being specific to any particular pair or pairs of chromosomes. By genetic tests, two of the trisomics were tentatively identified as triplo-1 and triplo-10.

For the situation in which a microsporic lethal gene is linked with another gene, a hypothetical frequency table was computed for genotypes among progenies resulting from selfing of the eight possible types of a trisomic when both loci are on the trisome. The necessary new nomenclature is proposed.

One of the aneuploids had as many as 8-10 extra chromosomes. The plant was weak and unfruitful and had light green foliage. This observation extends the upper limit of the chromosomes in the tomato aneuploid. Survival of the super hypersomic megaspore and consequently of the zygote resulting from it is attributed to the genic balance being near-diploid in the megaspore and near-triploid in the zygote.

A perfect association was observed between the anther color and fruit flesh color. Tangerine fruits were invariably found on those plants which had orange anthers and red fruits on plants with yellow anthers.

Microfilm \$2.50; Xerox \$4.80. 95 pages.

HERITABILITY OF GROWTH AND FEED UTILIZATION IN DAIRY CATTLE AS INDICATED BY IDENTICAL TWINS

(L. C. Card No. Mic 60-582)

Clinton Elwood Meadows, Ph.D.
Iowa State University of Science and Technology, 1959

Supervisor: Jay L. Lush

Estimates of heritability from identical twin dairy cattle have been, in general, much larger than those obtained from intra-sire regression of offspring on dam, or from sib correlations. Heritability ranges from 0.20 to 0.40 for most characteristics studied in dairy cattle, while estimates obtained from using identical twins are of the order of 0.85 to 0.95.

Several explanations have been offered for these differences in heritability estimates. Heritability computed from identical twins is heritability in the broad sense; that is, the numerator of the correlation contains not only the additive genetic variance, but also all of the non-additive genetic variance (variance due to dominance deviations and to epistasis) plus any genetic environmental interaction present. Also it has been suggested that identical twins are more contemporary than parent and offspring or than half-sibs and, therefore, environmental correlations which are not present in parent-offspring regression or sib correlations bias the estimates upward. This study was concerned mainly with the influence of genetic environmental interaction and environmental correlations.

Growth data were available from the Iowa State Agricultural Experiment Station herd of identical twin Holsteins for 8 pairs of twins 12 months of age and 16 pairs that were 6 months old. These data were supplemented by a 56-day growth and digestion study using the 8 older pairs.

The Iowa twin project is designed so that the component of variance due to genetic environmental interaction can be estimated, thus allowing it to be included or excluded from heritability estimates. Heritability of body weight at 6 months of age for 16 pairs of identical twins was 0.76 in the broad sense. Removal of the genetic environmental interaction component from the numerator of the correlation reduced heritability to 0.44. Heritability of wither height to the same age was 0.77 in the broad sense and the genetic environmental interaction component was small and negative, thus having no influence on heritability estimates. Heritability of total digestible nutrients per pound of gain in body weight was 0.69 in the uniform trial and 0.72 in the split trial. Removal of the genetic environmental component from the numerator of the correlation reduced heritability to 0.09 and 0.20.

The procedure followed in purchasing and rearing the identical twins was reviewed. The similarity of birth weights of the identical twins purchased and a concept of feeding according to some feeding standard suggested that this might be a source of environmental correlations in uniformity trials. This was tested, using two published uniformity trials. The animals were matched by birth weights, no twin being paired with its mate. The intraclass correlations at 6 months of age were 0.53 and 0.63. These correlations were considered partly genetic and partly environmental, thus precluding their direct use for removing environmental correlations from heritability estimates.

This study was on very few data but the results suggest that additional data should be collected for studying the influence of genetic environmental interaction on heritability estimates from identical twins. The size of the intraclass correlation obtained from unrelated animals paired according to birth weight suggests that environmental correlations are present in considerable amounts in identical twin studies and should be investigated as more data are available.

Microfilm \$2.50; Xerox \$4.60. 86 pages.

STUDIES OF MORPHOLOGY, GENETICS, AND CULTURE OF WILD-TYPE AND MORPHOLOGICAL MUTANT STRAINS OF *NEUROSPORA CRASSA*.

(L. C. Card No. Mic 60-296)

Jay Clarence Murray, Ph.D.
Cornell University, 1959

Ten morphological mutant strains of *Neurospora crassa* have been analyzed and described morphologically and genetically, and compared to the wild type of the species. Each of the mutant strains was found to differ from the wild type by a single gene. The approximate linkage position of each mutant gene was determined.

Wild-type *Neurospora* grows rapidly across an agar surface and when the mycelium attains a certain size, aerial hyphae develop and the conidiophores arise as branches on the aerial hyphae, producing conidia acropetally.

An aconidial mutant differs from wild type only by an inability to form conidia on the aerial hyphae, and by absence of the typical carotenoid pigment.

The linear growth rate of the other nine mutants is less than one per cent of the growth rate of the wild type strain. These mutants fall into the category of "colonial" mutants.

Eight of the colonial mutants form a compact aerial mycelium, and those that produce conidia do so only in old cultures. The mutants forming the compact aerial mycelia differ from each other by the dimensional growth rates of the mycelia, the frequency and pattern of hyphal branching, and by general characteristics of the hyphae. Two of the mutant genes that determined morphological variation were found to be ascospore lethals. Two others, found to be allelic, produced an aberrant type ascus when they were crossed with each other, but a normal one when they were crossed to wild type and to the other mutants.

The colonial mutant that does not form the compact aerial mycelium produces only a limited aerial mycelium and has a greatly increased tendency to conidiate. In addition to these characters, this mutant has a unique type of hyphae.

The double-mutant combinations of genes determining morphological variation were isolated and the cultures were studied. The gene determining increased conidiation was able to induce the formation of a modified type of conidiation in the aconidial colonial mutants, but not in the aconidial strain with the spreading habit of growth. Some double mutant combinations had a growth rate only slightly slower than that of the slower growing of the single mutants involved; others grew much slower than either of the single mutants involved. The dimensions of the colonies of the double mutant combinations were usually approximately intermediate between those of the two single mutants involved. The hyphae of some double mutant combinations branched more frequently, and some were more swollen than the hyphae of the single mutants involved.

The mutant strains were grown under various cultural conditions. The outstanding effect observed in these studies was that one of the mutants grew much faster when sorbose was included in its medium. Sorbose drastically reduces the growth rate of wild type *Neurospora*. Other mutants showed no effect of sorbose in the medium or grew slightly slower.

Microfilm \$3.15; Xerox \$11.05. 242 pages.

VARIATION IN BUTTERFAT PRODUCTION IN STATE-OWNED HERDS IN IOWA

(L. C. Card No. Mic 60-593)

Devadason Sundaresan, Ph.D.
Iowa State University of Science and Technology, 1959

Supervisor: Jay L. Lush

The data for this investigation came from twelve state-owned herds in Iowa. The 12,623 records used were made by 4,487 cows during the period 1940 through 1956.

Variance components for herds, years, seasons and the interactions among them were computed. Herd differences and herd by year interactions were responsible for about 6 and 10 per cent of the total variance, respectively. The other sources were of minor importance individually, together they accounted for 4 per cent of total variance.

The records were corrected for the major environmental effects by taking each record as a deviation from the average of all records made in that herd in the same year the record was made. The genetic analysis was then made, using only the records of cows whose sires and dams each had at least two daughters in the herd. This restricted the genetic analysis to 7,003 records by 2,398 daughters of 295 sires. This analysis was made in three different ways: (1) hierarchical classification, (2) full sister analysis, and (3) cross classification. By the first method, four times the sire component estimated the intra-herd heritability of butterfat production as 0.16, assuming epistatic effects to be negligible. By the second method, twice the full sister component gave an estimate of 0.12. By the first method 1.6 per cent of the total variance was attributed to dominance deviations and other things, such as maternal effects, that make full sisters resemble each other more than twice as much as paternal half sisters. In the cross classification, the component for sire by dam interaction was 1.8 per cent. This interaction measures deviations from the average effects of genes and also could include some variance due to dominance, to epistatic effects, and to environment and genotype interaction.

When the genetic analysis was conducted with original records uncorrected for environmental effects, considerably larger components were obtained. This happened because parts of the herd and herd-year effects were included in the component for sires and for dams. If, as seems probable, the genetic part in those differences between herds and between years within herds was small, the resulting components contained considerable portions which were really environmental in origin, even though they appeared as "sire components" or as "dam components." This might partially explain the divergence in heritability estimates obtained for butterfat production in various investigations.

Microfilm \$2.50; Xerox \$5.20. 104 pages.

A CYTOGENETIC STUDY OF THE DWARF-VARIEGATED PHENOTYPE IN *NICOTIANA*

(L. C. Card No. Mic 60-619)

Ukio Urata, Ph.D.
Cornell University, 1959

This study was undertaken in order to elucidate the causal mechanism of a phenotype which occurred in certain F_2 and advanced generation progenies of the hybrid *Nicotiana langsdorffii* x *N. sanderae*. The phenotype was dwarf, had mottled leaves and spotted flowers, exhibited variable bud fall, and was completely sterile. It was therefore named dwarf-variegated.

The genetical segregation in the hybrid was extremely irregular and did not conform to any common ratios. The dwarf-variegated character did not appear in the parental species or in the F_1 , but occurred only in the F_2 and in some of the F_3 populations. The dwarf-variegated phenotype occurred only in lines in which a specific group of *N. sanderae* plants was used as a parent in the F_1 hybrid. Trisomy itself was not related to dwarf-variegated.

Several types of dark:light and dark:white twin-spots occurred in the flowers of normal and dwarf-variegated plants. Comparatively, these were infrequent in the normal plants but very frequent in dwarf-variegated plants. Flowers with twin-spots always exhibited single spots of the types which comprised the twins. Many of the dark single and twin-spots were heavily mottled, and it was concluded that some type of breakage-fusion-bridge system was responsible for this phenomenon since bridge formation was common in somatic divisions of the dwarf-variegated plants.

Cytological study indicated that the sterility was caused by asynapsis. Chromosome fragmentation was frequently associated with asynapsis in the meiotic cells of many of the dwarf-variegated plants.

The somatic cytological behavior was also aberrant in the dwarf-variegated plants, showing a great increase in the formation of laggards, somatic micronuclei, polyploid cells and bridges. The prophase-metaphase ratio is also altered in dwarf-variegated plants, the metaphases being comparatively much more frequent in dwarf-variegated than in normal plants.

It is suggested that the increase in spotting, the increase in somatic cytological aberrations, the change in the prophase-metaphase ratio, and the asynapsis and fragmentation which occurred in the dwarf-variegated plants may be due to the abnormal synthesis and accumulation of a chemical or chemicals capable of causing c-mitotic and radiomimetic effects.

Microfilm \$2.50; Xerox \$6.20. 129 pages.

BOTANY

DEVELOPMENTAL ANATOMY OF THE TRACHEARY SYSTEM IN *BERBERIS THUNBERGII* DC., WITH EMPHASIS ON THE DIFFERENCES BETWEEN PROTOXYLEM AND METAXYLEM, PRIMARY XYLEM AND SECONDARY XYLEM.

(L. C. Card No. Mic 60-615)

Rose-Marie Savelkoul Abbott, Ph.D.
Cornell University, 1959

Primary and secondary xylem, protoxylem and metaxylem currently are defined on an ontogenetic basis. An attempt was made to determine whether morphological features of xylem elements could be used to modify these definitions, and whether morphological features could be used as indicators of the stages of xylem development. A study correlating morphological and ontogenetic features of xylem elements of *Berberis thunbergii* DC. was carried out. Length and width were measured and end-wall type determined for spiral, reticulate, and pitted elements in the internodes of 10 shoots. Xylem element lengths were compared statistically; the degree of correlation of length and width, of length and end-wall type was determined, as was the degree of correlation between xylem element length and internode length.

The spiral and reticulate elements differentiate during internode elongation; pitted elements differentiate after internode elongation has ceased. The spiral elements mature during elongation; reticulate elements mature after elongation.

A highly significant difference in length existed between the reticulate and pitted elements. Length and width of the xylem elements were correlated: the shortest elements were the widest. Length and end-wall type were correlated: the longest cells had the steepest end-walls. The lengths of the spiral and reticulate elements were correlated to internode length: the shortest elements occurred in the shortest internodes. The length of the pitted elements was independent of internode length.

It is possible to classify the xylem elements ontogenetically as to the time of differentiation and maturation. It is also possible to classify the elements using the correlated morphological features of length, width and end-wall types. The two classifications are interrelated: the short and wide pitted elements differentiate after elongation; the long and narrow spiral and reticulate differentiate during elongation. Therefore the morphological features of the cells can be used as indicators of the stages of xylem ontogeny.

The following definitions of the xylem types were appropriate to *B. thunbergii*: primary xylem is the xylem which differentiates during elongation; secondary xylem is the xylem which differentiates after elongation has ceased; protoxylem is the xylem which matures during elongation and which is stretched during further elongation; metaxylem differentiates during elongation, but

matures after elongation. Primary xylem can be distinguished from secondary xylem by the hiatus in cell length and by the wall pattern, width and end-wall type of the cells. Protoxylem can be distinguished from metaxylem by the stretchability of the mature cells and by the wall pattern of the cells.

Microfilm \$2.50; Xerox \$7.20. 151 pages.

CAROTENE DISTRIBUTION IN THE SWEET POTATO

(L. C. Card No. Mic 60-543)

Russell M. Ampey, Ph.D.
Michigan State University, 1959

The data presented indicate that three sweet potato varieties contained different amounts of carotene. The Queen Mary variety had the highest concentration, the Porto Rico Unit I less, and the Porto Rico variety the lowest concentration.

Carotene is not uniformly distributed throughout the root. The stem-end of the root contained more carotene than the center region and the center region had more than the root-end. Transverse carotene concentration differences were also indicated with the core usually containing more carotene than peelings. Whereas longitudinal difference in the carotene distribution appeared to be characteristic, the transverse differences may alternate from year to year.

It appeared that carotene synthesis continued for some time in the sweet potato root after harvest. During storage, the carotene tends to become more uniformly distributed throughout the root. The ratio of the carotene contained in the root-end compared to that contained in the stem-end increased during storage.

The peelings of sweet potatoes contained considerable carotene. Discarding this region of the root results in a substantial loss of pro-vitamin A.

The data indicate that the Queen Mary and the Porto Rico sweet potatoes were superior to the Unit I variety in the retention of carotene during storage.

Microfilm \$2.50; Xerox \$3.60. 65 pages.

STUDIES OF THE PHYTOCIDAL ACTION OF 3-AMINO-1,2,4-TRIAZOLE

(L. C. Card No. Mic 60-401)

Mason Carlton Carter, D.F.
Duke University, 1959

Chairman: A. W. Naylor

Studies of the translocation and metabolism of 3-amino-1,2,4-triazole in honeysuckle (*Lonicera japonica* Thunb.) and beans (*Phaseolus vulgaris* var. Black Valentine) were conducted using ATA-5-C¹⁴ as a tracer. In general, the findings were in agreement with those of other workers, in that ATA was absorbed and translocated quite rapidly. Within 12 hours after application of ATA-5-C¹⁴, radioactivity was detected throughout honeysuckle plants which were 12 to 14 inches long from stem tip to root tip.

Metabolic transformation of ATA by bean plants occurred before the phytocide reached the extremities of the plant. When ATA-5-C¹⁴ was applied to one primary leaf of two-week-old bean plants, large quantities of radioactivity appeared in the stem tips, stems and roots. However, analysis of the plant extracts by two-dimensional paper chromatography and autoradiography showed that unaltered ATA was not present in the stem tips or roots. The majority of the labeled carbon from ATA-5-C¹⁴ in stem tips and roots was in an unknown compound designated as "1". Studies of the metabolism of ATA-5-C¹⁴ by several other species revealed that compound "1" was the principal transformation product of the phytocide in these plants also. Twelve other transformation products of ATA-5-C¹⁴ were detected during the course of this investigation and a chromatographic map of ATA derivatives was prepared.

Respiration, dark fixation, and the metabolism of labeled glucose and succinate by bean plants were not appreciably altered by the presence of ATA. The phytocide produced some changes in the metabolic patterns of glucose-U-C¹⁴ and succinate-2,3-C¹⁴ but these changes were slight and it seemed unlikely that they were a significant part of the toxic mechanism of ATA.

However, ATA had a pronounced effect upon the metabolism of radioactive glycine and serine. In the presence of the unlabeled phytocide, radioactivity from glycine-1-C¹⁴, glycine-2-C¹⁴, glycine-U-C¹⁴ and serine-U-C¹⁴ was transferred to compound "1", the previously mentioned, unknown metabolic product of ATA.

When bean tips were fed labeled glycine or serine in a 0.1 M solution of ATA, almost half of the label transferred from the two amino acids appeared in the unknown compound "1". At the same time, the labeling of other metabolic products of glycine and serine was greatly reduced. It appeared that the plants were forming a complex between ATA and glycine or serine producing a shortage of these amino acids for other metabolic reactions.

The discovery that compound "1" was a complex between ATA and glycine or serine led to the isolation of the unknown and a study of some of its chemical characteristics. Compound "1" was found to contain unaltered ATA for the phytocide was regenerated by 6.0 N HCl hydrolysis. Several other hydrolytic products were recognized as one or more of the metabolic transformation products of ATA-5-C¹⁴ produced by plants during earlier studies, but none of the hydrolytic products could be identified as the glycine

or serine contribution to compound "1". The fact that neither glycine nor serine was regenerated by acid hydrolysis led to the belief that a common derivative of these two amino acids participates in the reaction with ATA to form compound "1".

The data gathered during the current investigation suggest that the phytocidal effects of ATA result from a disruption of C₁ metabolism. Both glycine and serine may contribute carbon atoms to C₁ metabolism and ATA is structurally similar to several of the imidazoles which act as C₁ acceptors during purine and pyrimidine synthesis. The formation of compound "1" may represent a C₁ trap creating a shortage of these C₁ fragments for protein, porphyrin, enzyme, and nucleic acid synthesis. Such a shortage could easily produce the symptoms associated with ATA toxicity and eventually result in the death of the plant. There is no direct evidence in support of this speculation, but there is sufficient indirect evidence to justify an attempt to prove or disapprove the hypothesis.

Microfilm \$2.50; Xerox \$4.40. 81 pages.

INVESTIGATIONS OF THE UPTAKE OF CATIONS BY STORAGE TISSUES

(L. C. Card No. Mic 59-6373)

Robert Morton Chasson, Ph.D.
University of Missouri, 1959

Supervisor: Dr. J. Levitt

There are a number of factors involved in the process of ion accumulation by plant cells, e.g., diffusion, permeability, adsorption, metabolism, energy transfer. The purpose of this investigation was twofold: first, to inquire into the above factors by attacking them both separately and in combination; second, to devise suitable techniques for this inquiry which would overcome what the author feels are shortcomings in some of the established methods.

Tissue slices were treated with labelled solutions as follows: The slices were strung on rods attached to gear-reduction motors. As the rods revolved the slices were alternately submerged and lifted free of the solution. This allowed for complete aeration of the slices and thorough mixing of the solution. In addition, removal of solution or tissue samples, addition of metabolic inhibitors, or changing of the ambient solution could be accomplished with little or no interruption of the accumulation process. Following a period of uptake, tissue slices were removed to solutions of the stable isotope in order to remove the exchangeable portion of the radioisotope. The tissue was next frozen and the cell sap expressed under pressure. The remaining residue was washed free of cell sap and analyzed for radioactivity. Thus, it was possible to separate uptake into distinct regions of the cell, i.e., cell wall, cytoplasm, and vacuole.

Tissue slices which had lost all their exchangeable calcium-45 to a stable calcium solution were found to yield large quantities of the radioisotope to a fresh stable calcium solution following killing of the tissue and removal of the cell sap. The interpretation was that the plasma-membrane prevented the loss of exchangeable calcium-45 from the cytoplasm by limiting the diffusion of the stable

calcium into the cell. After the cell was killed, free diffusion into the cell could take place and exchange loss occurred. This was considered as support for the classical concept of an outer plasmamembrane of limited permeability to ions.

At a concentration of 5.9×10^{-5} moles/liter dinitrophenol was found to stimulate the uptake of calcium by potato slices both at room temperature and 0°C . DNP at the same concentration inhibited the uptake of rubidium by potato slices. Both calcium and rubidium uptake in carrot were inhibited by DNP. Under certain conditions DNP was found to reduce the accumulation of radiocalcium in the cell sap of potato at the same time that uptake into the tissue was stimulated. It was suggested that DNP acts at two separate stages of the absorption process; it increases the initial non-metabolic adsorption and decreases the active accumulation into the vacuole. The final calcium concentration of the cell sap will depend on the balance of these two factors.

Indirect evidence was found for the participation of the mitochondria in the ion absorption process. A method of separating cellular particulates was described in which ethylenediamine tetra acetic acid was used along with the extraction solvent in order to prevent redistribution of previously adsorbed ions during the fractionation.

Microfilm \$2.50; Xerox \$7.40. 158 pages.

INHERITANCE OF RESISTANCE TO COVERED SMUT IN SEVERAL HYBRIDS OF BARLEY

(L. C. Card No. Mic 60-536)

Charles Cottingham, Ph.D.
Michigan State University, 1958

Major Professor: Dr. Richard L. Kiesling

The probable origin of barley has been suggested as Ethiopia and Asia. Barley is attacked by many fungi which are instrumental in decreasing yields. Covered smut caused by *Ustilago hordei* (Pers.) Largerh. is one of these fungi.

This investigation was concerned with the inheritance of resistance to race 6 of *U. hordei*, and the inheritance of morphological characters, in four non-commercial varieties of barley: Pannier, Odessa, Chevron and Jet. Pannier and Odessa have 6-row heads, covered caryopsis and blue aleurones. Chevron has a 6-row head, covered caryopsis and a white aleurone. Jet has a 2-row head, naked caryopsis, and a black aleurone.

Inoculations of seeds were made by the vacuum, and the hand-dehulled methods. These methods placed the covered smut spores within close proximity of the elongating coleoptiles which was necessary to initiate infection.

Inheritance of resistance to *U. hordei* race 6 in the crosses between Pannier x Odessa, Pannier x Chevron and their reciprocals, and Pannier x Jet was explained on the basis of two factor pairs. One factor pair was found to govern the characters, covered versus naked caryopses, and black versus blue aleurone in the cross, Pannier x Jet.

Microfilm \$2.50; Xerox \$3.00. 40 pages.

LANDSLIDES AND THEIR REVEGETATION IN THE WHITE MOUNTAINS OF NEW HAMPSHIRE

(L. C. Card No. Mic 60-263)

Edward Flaccus, Ph.D.
Duke University, 1959

Supervisor: H. J. Oosting

Scars of past landslides mark many of the steeper slopes of the White Mts. These slides are of the debris-avalanche type. Occasionally they have caused damage to roads, railroads, trails, reservoirs, recreation facilities, houses, and in a few cases have resulted in loss of life.

The present study was organized to provide information on the history of the slides, their characteristics, causative factors, and the nature of their revegetation.

The locations of all slide scars recognizable on 1954 aerial photos were plotted on USGS quadrangle maps.

Over 500 slides were thus located, and the information used in evaluation of effects on slide occurrence of bedrock, compass exposure, altitude, and lumbering.

Twenty-nine slides were visited, and measurements obtained of length, width, altitude, and slope. General observations were made, and presence lists compiled. The slides generally have three sections: an upper slide-section of ledge or till bared by sliding, a middle gully section, and a lower stream scour section. Total lengths sometimes reach 2 mi. Of the slide-sections only, lengths range to 0.7 mi., widths to 90 yds., and areas to 20 acres. Slopes of the slide-sections average 32 degrees.

The immediate cause of the slides is failure of internal resistance to downslope movement. This is caused in turn by the interaction of a number of contributing factors, only one of which, gravity, is unchanging. Sufficient slope, in the range of 25-35 degrees, is necessary. Given such slope and suitable mantle on it, the single most important contributing factor is high rainfall. Of the 135 dated slides, 93% are known to have occurred during heavy rains, but only in the June-November period. At other seasons the mantle is sufficiently frozen to be stable. Determination of the necessary intensity of rainfall is practically impossible. Slides may occur during heavy local showers, but most have occurred during intense, widespread storms, such as tropical hurricanes.

Other possible contributing factors were investigated. Nature of bedrock and compass exposure were found to be of no significance in affecting frequency. Lumbering has not increased susceptibility of slopes. On the contrary, there are theoretical grounds for suspecting that lumbering might act to reduce slide susceptibility slightly. The occasional operation as trigger factors of wind leverage on trees and noise from thunder and other slides is considered likely.

Slides occur naturally and independent of man's activity. No practical ways can be envisaged to prevent their occurrence or reduce their frequency. Avoidance of damage is possible, however, by wise planning of location of future facilities, and closing of certain at present dangerously located facilities during especially intense storms.

Revegetation of slides may be slow, as in primary succession on the broad, bared ledges and till areas near the slide-tops. On many other slide habitats succession may be considered secondary and can be very rapid. The

nature of the latter succession was worked out in detail by sampling the vegetation on a chronoseries of slides 9, 19, 30, 60, and 72 years of age. An early herbaceous stage is of limited importance. Pioneer hardwoods may come in rapidly to form a dense thicket, with an understory of spruce-fir. Paper and yellow birch are by far the most important species at this stage. After about 30 years the paper birch especially and the yellow birch to a lesser extent decline in relative importance, while spruce and fir continue to increase. By 72 years surface soils are comparable to those of the surrounding forests in organic matter and exchangeable cations, a new set of climax herbs is established, and the canopy is beginning to resemble the climax.

Microfilm \$2.55; Xerox \$9.00. 196 pages.

THE UTILIZATION OF GLUCOSE CARBON BY FIVE ISOLATES OF THE FUNGUS CERATOCYSTIS ULMI

(L. C. Card No. Mic 60-748)

Daniel Joseph Higgins, Ph.D.
The Ohio State University, 1959

The Dutch elm disease, incited by the fungus *Ceratocystis ulmi* (Buisman) C. Moreau, was first recognized as a serious disease of elm in Holland in 1918. Since then it has become epiphytotic in Europe, Canada, and the United States. In 1948 Dutch elm disease symptoms developed on a previously considered resistant strain of the smooth-leaved elm species *Ulmus carpinifolia* Gleditsch in the United States Department of Agriculture test plots near Columbus, Ohio. A strain of *Ceratocystis ulmi*, pathogenic on the resistant elm variety in subsequent tests, was isolated from the diseased tree by the investigators at this laboratory.

As the occurrence of this atypically pathogenic strain of *Ceratocystis ulmi* presented the opportunity of investigating the nature of pathogenicity and resistance, an investigation of the relative quantities of metabolic carbon products formed from glucose during growth was initiated. The atypically pathogenic strain was outstanding among the isolates in total acidity and in the percentage of carbon in the non-volatile acid category. This category is worthy of further investigation in that it might include a toxin accounting for the unusual pathogenicity.

Microfilm \$2.50; Xerox \$3.60. 64 pages.

A STUDY OF TEMPERATURE AND IONIZING RADIATION EFFECTS ON SOLUTE TRANSLOCATION IN PLANTS

(L. C. Card No. Mic 60-749)

Richard Holmes Hodgson, Ph.D.
The Ohio State University, 1959

Continuing interest in the mechanism of solute translocation in plants has occasioned critical studies of factors influencing transport phenomena in vascular species. In the present investigation, temperature and ionizing radiation effects on isotope distribution in Black Valentine bean have been studied in the range of 37.5 to 56.5°C and from

0 to 300,000 roentgens. P-32-orthophosphate, $C^{14}O_2$ and randomly labeled C^{14} -sucrose were supplied to bean leaves by the following methods: P-32 was supplied by "spot-application" (usually a 10-lambda droplet of solution applied to the upper leaf surface), or "flap-injection" (cf. Biddulph, O., Amer. Jour. Bot. 28: 348-352, 1941); C^{14} -sucrose was supplied via flap-injection; and $C^{14}O_2$ by a modified "leaf-cup" method (cf. Aronoff, S., Techniques of Radiobiochemistry, Iowa State College Press, 1956).

In most experiments all leaves and buds except the primary (supply) leaf and terminal bud were removed prior to treatment.

After a one-hour temperature pretreatment, a three-hour concurrent temperature treatment and isotope application were usually employed. Shoot tissue was harvested into two-cm sections, dried, weighed and extracted where appropriate. Counts were obtained on dried tissue (P-32 experiments) or on dried extracts (C-14 experiments).

With the exception of the treated petiole zones, all plants were maintained at or near 20°C during the experiments. Petiole temperature elevation to 42°C resulted in the highest mean stem activity levels for treated plants relative to control. Acropetal stem activity increased slightly with temperature following spot-application, but slightly decreased after the isotope had been flap-injected. While the above gradients differed significantly from each other ($P = 0.90$), no significant gradient alteration relative to temperature occurred below the supply nodes.

Flap-injected P-32 was transported from supply leaves more rapidly and in greater quantities than was spot-applied isotope. While translocation of flap-injected isotope appeared to be the less temperature sensitive, evidence is developed indicating that isotope so supplied traverses the treated petiole predominantly in the phloem. Further considerations led to the conclusion that progressive damage to both phloem and xylem occurs during the experiments and that the rapid exit of flap-injected isotope through the phloem is accomplished during early stages of petiole damage, thus reducing the observed temperature sensitivity of this process. The bearing of these observations on the effects of mode of isotope supply upon transport in the stem is discussed.

Labeled CO_2 was rapidly assimilated by supply leaves and the photosynthate exported in uniform amounts regardless of petiole temperature. This apparent temperature insensitivity is explained by assuming only a small portion of the labeled photosynthate to be translocatable. This fraction, synthesized over a short period, could then depart the leaf during a long-term experiment. Labeled sucrose, supplied over a longer period, was less mobile and more temperature sensitive than was translocatable photosynthate.

Massive doses of ionizing radiation supplied by a 45 KVP x-ray machine or an SR-90 medical applicator were without significant effect on translocation of P-32 when the petiole and hypocotyl tissue were exposed. This radio-resistance is taken as further evidence of the major participation of enucleate sieve tubes in phloem translocation. Surface incident doses equivalent to 10,000 R or more, when supplied to terminal buds, sharply reduced isotope translocation to them and to immediately subjacent tissue. This implicates the terminal bud as a major "sink" area for translocation and further suggests the participation of auxin in influencing translocation patterns in plants.

Microfilm \$2.50; Xerox \$6.40. 132 pages.

TIME COURSE OF THE PHOTOSYNTHETIC
INDUCTION PERIODS AND PHOTOSYNTHETIC
RHYTHMS IN CERTAIN HIGHER PLANTS AS
RELATED TO CHANGES IN DEGREE OF
STOMATAL OPENING

(L. C. Card No. Mic 60-752)

George Franklin Howe, Ph.D.
The Ohio State University, 1959

The induction period of true photosynthesis was studied in the attached leaves of certain higher plants. Carbon dioxide absorption of the leaf was estimated by monitoring the CO_2 content of an air stream after passing over the experimental leaf.

Certain effects of changes in stomatal diffusive capacity on rates of photosynthesis were studied during the induction period. Photosynthetic induction was measured while stomates were open and closed respectively. Stomates of Black Valentine bean, coleus, and geranium remained open in the darkness when supplied with air of near zero O_2 and/or CO_2 partial pressures, but closed rapidly when supplied with normal air (20 per cent O_2 and 0.03 per cent CO_2).

Comparisons of photosynthetic induction curves of these three species reveal correlations between the type of gas supplied during the darkness and the rate of photosynthesis during subsequent illumination in normal air. After a dark interval of 15-60 minutes in air of low CO_2 and/or O_2 content the stomates were generally open and the rate of photosynthesis was high during the first minutes of illumination. Following a similar dark interval in normal air the stomates were generally closed and photosynthetic rates were low during the induction period. In Black Valentine bean, coleus, and geranium, changes in the diffusive capacity of the stomates profoundly modified the time course of photosynthesis during the induction period. Such correlations were not evident in castor bean cotyledons.

Air of low O_2 and CO_2 content had a greater effect generally upon the time course of photosynthesis and the condition of the stomates in Black Valentine bean leaves than air deficient in either gas separately.

Photosynthetic induction curves and the effect of modified air streams upon such curves varied greatly between experiments performed at different phases of the usual photoperiodic cycle.

The extremely long photosynthetic induction periods, CO_2 bursts, and CO_2 gulps in *Kalanchoë* leaves following long dark periods at low temperatures were discussed in relation to Crassulacean metabolism.

The rate of stomatal opening in the light after dark periods of 12 hours or longer was estimated by infiltration techniques. Twenty-five and 15 minutes were required in the light for stomatal opening in Black Valentine bean and castor bean respectively. Photosynthetic induction periods in these plants were thus concurrent with induction periods of stomatal opening.

After 30 minutes of darkness in normal air, benzene readily infiltrated castor bean cotyledons but did not infiltrate Black Valentine bean leaves. Certain differences in these species between the photosynthetic induction curves after pretreatment in various gas streams probably resulted from differences in the respective rates of stomatal closure.

Rhythmic fluctuations occurred in the rates of photosynthesis of Black Valentine bean and sunflower leaves. The amplitude of the fluctuations often diminished during the first hour of illumination but sometimes remained undiminished for several hours. It was inferred from infiltration tests performed on the experimental leaves at the peak and trough phases that the stomates were open at the peak and closed at the trough of the cycle. Undiminished photosynthetic rhythms are directly related to undiminished stomatal rhythms.

Rhythmic fluctuations in photosynthetic rate appeared in one experiment only after the leaf had been subjected to a 4-minute dark period. The 4-minute period of darkness was directly related to the photosynthetic rhythm which followed.

The relation of stomatal rhythms to photosynthetic rhythms and the effect of near zero concentrations of CO_2 and/or O_2 on subsequent photosynthesis were discussed in relation to classical mechanisms of stomatal change.

Microfilm \$3.35; Xerox \$11.70. 259 pages.

THE UTILIZATION OF GALACTOSE IN
THE PRESENCE OF GLUCOSE BY
PRE-ADAPTED CULTURES OF
SACCHAROMYCES CEREVISIAE MEYEN

(L. C. Card No. Mic 60-278)

Golden Leon Howell, Ph.D.
University of Alabama, 1959

An isotopic tracer technique has been employed whereby the metabolism has been studied of labeled sugars and equimolar mixtures of labeled and non-labeled sugars, which were supplied to previously adapted yeast cultures. Evolved C^{14}O_2 was collected in saturated barium hydroxide as $\text{BaC}^{14}\text{O}_3$. A study of the utilization of these sugars by yeast cells was made by comparing the initial specific activity of the labeled sugar on oxidation with the specific activity of C^{14}O_2 obtained from respiration at various time intervals.

Glucose-adapted cultures utilized glucose more readily under aerobic than under anaerobic conditions. Glucose-adapted cultures when supplied the equimolar mixture anaerobically used a higher percentage of glucose for the first sixty minutes than was used under aerobic conditions. This situation appeared to be reversed for the second hour period. Glucose-adapted cultures gave evidence of slight utilization of pure galactose under both aerobic and anaerobic conditions, except for anaerobic conditions at the 15 minute interval.

There was only slight utilization of pure galactose by galactose-adapted cultures under both aerobic or anaerobic conditions. There was a marked increase for the first hour in utilization of glucose- C^{14} in the presence of galactose by galactose-adapted cultures under both aerobic and anaerobic conditions. There appeared to be a general increase in utilization of galactose- C^{14} in the presence of glucose when supplied to galactose-adapted cultures under aerobic conditions. Galactose-adapted cultures exhibited the ability to utilize readily pure glucose under aerobic conditions and to a lesser extent under anaerobic conditions.

Microfilm \$2.50; Xerox \$3.60. 65 pages.

AN ECOLOGICAL STUDY OF THE AMERICAN BEECH ALONG THE SOUTHWESTERN BORDER OF ITS DISTRIBUTION

(L. C. Card No. Mic 59-6378)

Lowell Alvin Logan, Ph.D.
University of Missouri, 1959

Supervisor: Dr. Clair Kucera

The southwestern limits of American beech distribution extends from extreme southern Illinois, through the "boot heel" of Missouri, across north Arkansas, includes two eastern Oklahoma counties, and terminates in east Texas. Twenty-nine field stations along this border were analyzed to: (1) examine beech conditions in the region, (2) ascertain the ecological factors limiting the distribution of the species, and (3) survey the plant communities of which beech is a part.

Both physical and biological data pertaining to the growth of beech, including aspect, erosion, and ground cover, were collected at each of the twenty-nine stations visited during the course of this study. Beech stands were found principally on soils derived from sandstones, sandy clays, and alluvial deposits, in sheltered habitats. Local habitat conditions appeared more important than the geology of the region. Laboratory analyses were made of surface and subsoil samples, which revealed a high sand percentage and generally low field capacity and wilting coefficient values. Comparisons of herbarium specimens from the entire range of beech revealed two distinct varieties, namely, var. *caroliniana* in the extreme southern range and var. *grandifolia* in the New England states. Climatic data showed that precipitation, particularly winter and spring rainfall, was consistently higher along the beech border than at selected weather stations west of the border.

Beech populations were limited to moist, sheltered habitats where the soil was coarse sand and ground water was close. In seemingly suitable areas where beech was absent, the lack of protected habitat or poor drainage appeared to prohibit the establishment of the species. It was noted that the beech stands along the border constituted relic communities. No seedlings or saplings were observed and young trees were noted in only four of the northernmost stations. Mature trees were present in all stations, but many showed poor form and vigor. Stand decadence increased southward. It is suggested that beech populations are declining along the southwestern border of its distribution.

Microfilm \$2.50; Xerox \$5.80. 120 pages.

SPERMATOPHYTES OF THE DES MOINES LOBE IN IOWA

(L. C. Card No. Mic 60-583)

Paul Herman Monson, Ph.D.
Iowa State University of Science and Technology, 1959

Supervisor: Dr. R. W. Pohl

This report consists of an annotated check-list with keys to the families, genera and species of spermatophytes

of that part of north-central Iowa which was glaciated during the most recent advances of the Wisconsin Glacier in Iowa. This area, known as the Des Moines Lobe, includes approximately 12,000 square miles in a tongue-shaped area about 90 miles wide and 140 miles long. It has not previously been treated in a detailed floristic study.

During the course of the study the author collected approximately 3000 specimens from the area of the Des Moines Lobe and checked and annotated an additional 25,000 other specimens. All of these specimens are now on file in the Herbarium of Iowa State University at Ames, Iowa.

Treated in the keys and check-list are 921 species of native, naturalized or commonly cultivated seed plants. These species are arranged in 338 genera of 104 families. In addition to those in the check-list, the keys provide for the identification of five families, 36 genera and 47 species which are rarely adventive, frequently cultivated or of widespread distribution and likely to be encountered by future students of the Des Moines Lobe flora.

For each species in the check-list there is included a listing of frequently encountered synonyms, common names in general use, notes on habitat, range within the Des Moines Lobe, frequency or abundance and flowering dates. For those species which are rare, a complete citation is included for each specimen examined.

Excluded from the study are the Gramineae and Leguminosae which are currently being studied and revised at Iowa State University. Also excluded are *Rubus* L. and *Crataegus* L. which present problems beyond the scope of the study and *Carex* L. and *Viola* L. which have recently been treated in papers dealing specifically with the Iowa flora.

A brief discussion of edaphic, climatic and topographic features of the area is included.

Microfilm \$4.55; Xerox \$16.00. 355 pages.

THE ALGAE OF OKLAHOMA (EXCLUSIVE OF DIATOMS)

(L. C. Card No. Mic 59-5959)

William C. Vinyard, Ph.D.
Michigan State University, 1958

Major Professor: G. W. Prescott

INTRODUCTION

Studies on the algae of Oklahoma were carried out during the period from June of 1952 through May of 1954 under the sponsorship of the University of Oklahoma Biological Survey. The purpose of this study was 1) to make a compendium of the algal flora for the State, and 2) to record observations on the ecology of the algae noting especially any relation between the distribution of species and the geochemistry of the habitats in which they were collected.

Publications on the algae of Oklahoma are reviewed and their contributions noted. The location and general features of the area studied are briefly discussed. A map of Oklahoma is included which locates various regions within the State to which reference is made. Descriptions of

physical features and biotic districts are given, and their relative positions shown on maps of the State.

METHODS AND MATERIALS

The methods and materials are those in standard usage in collecting, preserving and illustrating algae and in the determination of physical and chemical characteristics of the water in which they were found.

ECOLOGY

A brief general introduction to this subject is followed by discussions of macro- and microhabitats and their subdivisions or types. Outlines of these environmental groupings are given to include definitions of terms as used herein.

A discussion of environmental limitations is given under the heading of biogeochemistry. Regional as well as local aspects are considered under the subdivisions of: pH; CO₂ and carbonates; total solids as a measure of salinity; clay turbidity; soils. The nature, origin and possible effects of these factors on algal growth and distribution is discussed. The action of algae on these factors is also considered. Tables are presented which summarize quantitatively these factors as existing at certain times in a variety of macrohabitats. Less complete information of a similar nature is given in the Appendix as part of the descriptions of many of the specific habitats which are sampled in the study.

SYSTEMATIC OUTLINE

All of the species identified in this study, including four new to science and 101 records new for the State, are combined with those previously reported to form a complete algal flora comprising a total of 761 species, varieties and forms. Of the previously reported names 38 have been placed in synonymy. For each of the Classes of algae the following numbers of taxa are included;

CHLOROPHYCEAE:	26 Families; 94 Genera; 640 Species and Varieties.
CHAROPHYCEAE:	1 Family; 2 Genera; 8 Species.
XANTHOPHYCEAE:	3 Families; 5 Genera; 17 Species.
CHRYSPHYCEAE:	1 Family; 2 Genera; 2 Species.
EUGLENOPHYCEAE:	1 Family; 4 Genera; 24 Species.
DINOPHYCEAE:	4 Families; 5 Genera; 7 Species.
MYXOPHYCEAE:	10 Families; 29 Genera; 63 Species.

The Desmids, consisting of two Families in the Chlorophyceae, comprise the largest group with representatives in 22 Genera and 284 Species, Varieties and Forms; 121 of these are in the Genus *Cosmarium*.

New to science are described and figured two species of *Cladophora*, a variety of *Cosmarium Askenasyi* Schm., and a variety of *Cosmarium Turpinii* de Breb.

The Systematic Outline includes information for each accepted name as follows: the complete citation with author and date; synonyms under which previously reported; a reference citation to illustrations and/or descriptions published, where possible, in English; notes on morpho-

logical variation in the Oklahoma material, where appropriate; descriptions of new species, and varieties; brief notes on ecology (more complete information is to be found in the Appendix); citations of authors and dates of publications reporting algae from the State and including reference to any illustrations; locality and habitat.

APPENDIX

Appendix I lists the counties of Oklahoma with symbols for cross-reference to location; these symbols are used in the Systematic Outline.

Appendix II alphabetically lists the names of specific macrohabitats sampled and which are referred to in the text and tables. Under each of these is given a brief description with any physical or chemical data determined during the course of the study.

ILLUSTRATIONS

Species and varieties new to science, and those for which illustrations from Oklahoma material have not been published are figured herein on seven plates. The total of these illustrated is 86.

Microfilm \$2.75; Xerox \$9.45. 210 pages.

PRELIMINARY STUDIES ON LONGEVITY OF CORN POLLEN AND RELATED PHYSIOLOGICAL FACTORS

(L. C. Card No. Mic 60-622)

David Burton Walden, Ph.D.
Cornell University, 1959

A study of corn pollen was initiated in 1956. Initially, the methodology for testing corn pollen viability was developed and then applied to pollen studies, with an emphasis on pollen longevity. Secondly, the respiration of corn pollen grains, of corn pollen suspended in phosphate buffer pH 7.3, and of a particulate preparation from corn pollen was investigated. A study of the respiration of a particulate preparation from corn seedlings complemented the pollen respiration study.

A bio-assay was developed and tested to measure the viability of a sample of pollen. The bio-assay (the K assay) consisted of the pollination of an ear with a known and repeatable amount of pollen. The datum (K datum) for that pollination was the number of kernels produced on the ear. In this way, K data were obtained for a number of pollen treatments. The use of appropriate treatment arrangements and experimental designs allowed the statistical analysis of the K data for a number of experiments. K data were compared with data in the forms $\sqrt{K+1}$ and $\arcsin \sqrt{P}$, where P equals K/ the number of ovules on the ear of which K is a measure. The assumptions involved in the execution of the K assay were explained and some were experimentally confirmed.

Pollen variables studied included the quantitative dilution of fresh, viable pollen using killed corn pollen as the diluent; the optimal time of pollen collection; the optimal post-collection treatment of pollen for the purpose of

retaining longevity: pollen longevity as a function of the storage temperature; and a survey of pollen longevity as a function of the source of pollen. In addition, the statistical treatment of one experiment permitted the development of a formula to estimate the variance of a treatment mean from the variances observed for pollen sample replication and the number of subsamples (pollinations) made from each replication.

In most experiments, the moisture content of the pollen sample was obtained at the time the treatment started.

It was concluded from this phase of the pollen study that:

1) K data were a valid measure of treatment effects if adherence to the assumptions and restrictions of the assay was practiced;

2) Corn pollen longevity was influenced by the storage temperature and the moisture content of the pollen at the beginning of the storage treatment;

3) Corn pollen longevity can be maintained for at least 200 hours in some samples stored at temperatures between -8°C . and 5°C .;

4) The source of pollen was an important consideration in experiments involving pollen treatments.

The respiration of corn pollen and a particulate preparation was studied manometrically. In addition, a low

temperature difference spectrum was presented for corn pollen. From this study, it was concluded that:

1) The respiration of corn pollen was temperature dependent as well as dependent upon the moisture content of the pollen;

2) The respiration of corn pollen involves the cytochrome electron transport system;

3) The cytochrome absorption maxima determined for corn pollen were: cytochromes $a+a_3=598\text{ m}\mu$; cytochrome $b=557\text{ m}\mu$; cytochrome $c=549\text{ m}\mu$.

An active particulate preparation was obtained from corn seedlings. The oxidation of several intermediates, with an emphasis on succinate oxidation, were studied. Absorption and difference spectra of cytochromes were presented for 10 different lines of corn seedlings. From this study it was concluded that:

1) The respiration of corn seedling particles involves the cytochrome electron transport pathway;

2) Succinate oxidation was inhibited by azide and cyanide, and stimulated by AMP;

3) The particulate preparation oxidized DPNH and cytochrome c (Fe^{++});

4) The cytochrome absorption maxima for most seedling preparations were: cytochrome $a+a_3=599\text{ m}\mu$; cytochrome $b=557\text{ m}\mu$; cytochrome $c=551\text{ m}\mu$.

Microfilm \$3.00; Xerox \$10.60. 232 pages.

CHEMISTRY

CHEMISTRY, GENERAL

SPECTROPHOTOMETRIC STUDIES OF BROMINE COMPLEXES

(L. C. Card No. Mic 60-534)

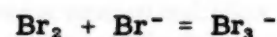
Henry Barber, Ph.D.
Michigan State University, 1958

Major Professor: James C. Sternberg

A spectrophotometric study was undertaken to investigate the nature of complexes involving molecular bromine in solution. Initial studies of the complexing of bromine in aqueous solution were made with the system, water-bromine, which shows, in addition to the visible bromine absorption, a short wavelength band in the approximate wavelength region, 2550-2650Å. These early studies led to the major portion of the present work in which the formation equilibria of the tribromide and dibromochloride ions in aqueous solution at 25° were investigated. Bromine complexing with acetonitrile and ethylene dichloride was also investigated spectrophotometrically.

With the water-bromine system, the interpretation was necessarily qualitative because of the instability, as indicated by the time-dependent spectral changes, of the very dilute bromine solutions. Assuming that the low wavelength band is due principally to the presence of the tribromide ion, which is formed through bromine hydrolysis, a reaction scheme was then postulated to account for the observed changes.

The system, water-bromine-sodium bromide, was ultimately chosen for quantitative study of the tribromide ion equilibrium; formation of the tribromide ion results from the reaction,



Ultraviolet absorption by the trihalide ion is characterized by a very intense band with a maximum at 2660Å. A method was developed for treatment of the data, which led to values of 3.46×10^4 and 17.3 liter mole $^{-1}$ for the molar extinction coefficient at the band maximum and the equilibrium constant, respectively. The value for the equilibrium constant is in agreement with those obtained by other investigators using non-spectrophotometric methods based upon distribution experiments.

The dibromochloride ion equilibrium study was first attempted with the system, water-bromine-sodium chloride. However, a complex reaction sequence seemed to prevail, as evidenced by the non-concordant results. It was decided to modify the spectrophotometric approach to the dibromochloride equilibrium by study of the system, water bromine-sodium chloride-sodium bromide; the undesirable effects are suppressed by addition of the bromide. Through use of the data already obtained for the tribromide study, this system did lend itself to quantitative treatment, despite the presence of both the tribromide and dibromochloride ions. The molar extinction coefficient at the band maximum (2430Å) and the equilibrium constant were calculated to be 2.19×10^4 and 1.39 liter mole $^{-1}$, respectively. The value for the equilibrium

constant is in excellent agreement with those resulting from non-spectrophotometric methods.

The system, acetonitrile-bromine, is characterized by an intense ultraviolet absorption with a peak at 2690Å. As with the water-bromine study, a quantitative treatment proved unfeasible due to time-dependent spectral changes. Nevertheless, some significance could be ascribed to the observed changes. The absorption is believed to be due to the ion pair, $\text{CH}_3\text{CNBr}^+\text{Br}_3^-$. The postulated equilibria for the system, including the formation equilibrium for the ion pair, can lead to an explanation for the spectral changes.

The ethylene dichloride-bromine system also exhibits an intense absorption in the ultraviolet region of the spectrum. The maximum of this band could not be observed because of the limited transparency of the solvent itself. It is probable that the 1:1 complex, $\text{ClCH}_2\text{CH}_2\text{ClBr}_2$, is the absorbing species. The work with ethylene dichloride also led to a novel means for purification of this solvent; the method should prove feasible as a means of obtaining spectroscopic-grade ethylene dichloride.

Microfilm \$2.50; Xerox \$6.60. 139 pages.

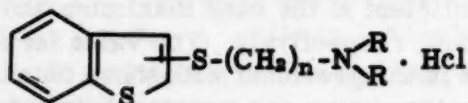
THE SYNTHESIS AND STUDY OF SOME THIANAPHTHENETHIOLS AND ω -(N,N-DIALKYLAMINO) ALKYL THIANAPHTHYL SULFIDES.

(L. C. Card No. Mic 59-5595)

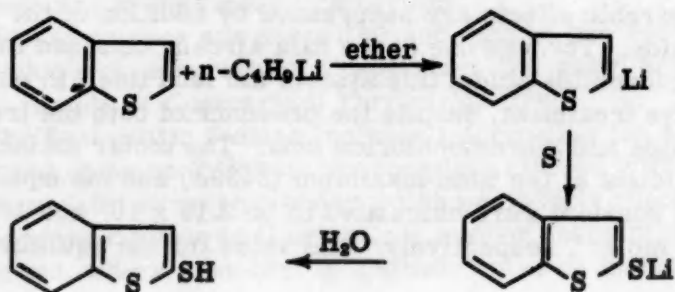
Charles E. Heyd, Ph.D.
Michigan State University, 1957

Major Professor: Robert D. Schuetz

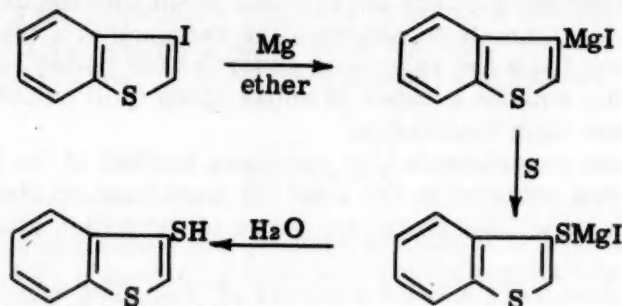
This study deals with an investigation of the heretofore unknown thianaphthenethiols, and the synthesis from them of thianaphthyl alkyl sulfides having a tertiary amino group on the terminal carbon of the alkyl chain. This study was undertaken for the purpose of extending the work previously done in the field of synthetic local anesthetics containing the thio ether linkage (1,2,3). These compounds can be represented by the general formula,



The thianaphthenethiols, 2-thianaphthenethiol, 3-methyl-2-thianaphthenethiol, 3,5-dimethylthianaphthenethiol, and 3,7-dimethylthianaphthenethiol, were prepared by the metalation of the appropriate thianaphthene derivative with *n*-butyl lithium, and subsequent reaction with powdered sulfur. The general reaction scheme is illustrated for the preparation of 2-thianaphthenethiol,

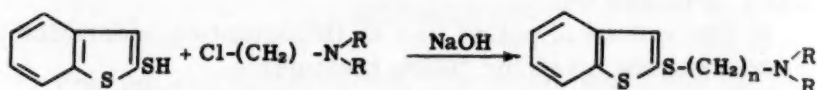


The mercaptan 3-thianaphthenethiol was synthesized by employing a Grignard reaction starting with 3-iodo-thianaphthene,



The preparation of thiols by the reduction of sulfonyl chlorides with lithium aluminum hydride was found inapplicable to thianaphthene as a synthetic approach due to the sensitivity of the latter towards chlorosulfonic acid.

The preparation of the tertiary aminoalkyl thianaphthyl sulfides can be represented by the general equation,



The tertiary amino alkyl chloride hydrochlorides, β -dimethylaminoethyl, β -diethylaminoethyl, γ -dimethylamino-*n*-propyl, α -methyl- β -dimethylaminoethyl, β -morpholinoethyl, γ -morpholino-*n*-propyl, β -piperdinoethyl, γ -piperdino-*n*-propyl, β -thiomorpholinoethyl, and γ -thiomorpholino-*n*-propyl chloride hydrochlorides, were used in the present investigation.

Microfilm \$2.50; Xerox \$5.20. 104 pages.

DETERMINATION OF THE FEASIBILITY OF IMPROVING THE TEACHING OF INTRODUCTORY COLLEGE CHEMISTRY THROUGH A CASE-STUDY APPROACH

(L. C. Card No. Mic 60-793)

Celia Mae Scott, Ph.D.
The Ohio State University, 1959

The purpose of this study was to determine the applicability of a case-study approach to the teaching of chemistry in the general education program. Such an approach involves extensive use of experimental materials in such a way as to permit the student to develop the desired concepts and derive the related generalizations basic to the learning in question. Recent advances in knowledge relative to the learning processes indicate that such an approach could be made more effective than the conventional expository lecture methods commonly in use.

The plan of this study involved the selection of ten topics commonly taught in general chemistry in college and the subsequent development of an approach to these topics consistent with modern educational theory. In this development, emphasis was directed to the use of experimental work as a basis from which to direct student thinking toward the derivation of the generalizations appropriate to the experimental evidence. In this way students are led to evolve the basic concepts which form the foundation for understanding chemistry and its importance in their daily living situations.

For the purpose of evaluation, the investigator sought the assistance of a group of chemistry teachers whose professional activities were indicative of their interest in problems relating to the teaching of general chemistry. From an initial group of thirty-three instructors, twenty-one agreed to assist in the evaluation, and twelve of the evaluation forms were returned completed and in usable form.

A summary of the responses submitted by these judges shows an average affirmative response of 85 per cent and an average negative response of 5 per cent relative to the outline of approach as presented. From these results it may be tentatively concluded that the proposed approach is a feasible one. In the light of present knowledge relative to learning processes, it may be reasonably concluded that the proposed method provides an approach which should, with continued refinement, prove to be more effective than conventional procedures.

The judges, however, identified some limiting factors which might serve as proper cautions to those wishing to pursue experimental teaching along these lines. Among these limitations are found (1) the need to limit class size, (2) the desirability of selecting students on the basis of ability, (3) the need for limitation of the amount of material to be studied in order to permit more comprehensive consideration of selected material, and (4) the need for adequate reference materials and essential equipment for the work.

One further limitation to such an approach arises as a result of the role of the instructor. The success of the proposed method depends not only upon the selection and organization of materials but also upon the sensitivity of the instructor to all factors contributing to the learning situation. This sensitivity arises from a basic understanding of the way in which learning takes place and requires a predisposition on the part of the instructor to make use of such understanding in all aspects of the teaching situation from the initial presentation through the final evaluation of the desired learning products.

In summary it may be said that the results of this study indicate the feasibility of the proposed approach to the teaching of chemistry. With due regard for the cautions expressed relative to the use of this approach, it seems reasonable to conclude that the teaching of introductory chemistry for the general education student could be made more effective through such an approach.

Microfilm \$2.80; Xerox \$9.70. 213 pages.

CHEMISTRY, ANALYTICAL

STABILITY CONSTANTS OF SOME M(I)- AND M(II)-1,10-PHENANTHROLINE COMPLEXES.

(L. C. Card No. Mic 60-572)

Richard Fullerton, Ph.D.

Iowa State University of Science and Technology, 1959

Supervisor: Charles V. Banks

The method proposed by Grimes for the determination of the stability constants of 1,10-phenanthroline complexes

by means of the silver/bis(1,10-phenanthroline)silver(I) nitrate ($\text{Ag}/\text{AgP}_2\text{NO}_3$) electrode has been evaluated further.

In order to determine the standard working potential of the $\text{Ag}/\text{AgP}_2\text{NO}_3$ electrode it was necessary to determine the over-all formation constant of the bis(1,10-phenanthroline)-silver(I) ion and the solubility product of the nitrate salt of this species. The necessary calculations were made from potentiometric titrations of silver sulfate and silver nitrate with 1,10-phenanthroline. The $\log K_2$ value of the bis(1,10-phenanthroline)silver(I) complex was calculated to be 11.6, while the K_{sp} of the nitrate salt of this ion was found to be $10^{-8.49}$. From these values and the standard reduction potential for the silver electrode a value for the working potential of the $\text{Ag}/\text{AgP}_2\text{NO}_3$ electrode was calculated to be -0.378v. vs. the saturated calomel electrode.

The reversibility of this electrode was tested by two methods, both of which indicated the electrode is reversible. The response of the $\text{Ag}/\text{AgP}_2\text{NO}_3$ electrode to the square of the free 1,10-phenanthroline concentration was demonstrated by a series of titrations of 1,10-phenanthroline in potassium nitrate with potassium nitrate. In these titrations the beginning total 1,10-phenanthroline concentration was about 100 times the total potassium concentration. Under these conditions the total ligand concentration could be substituted in the Nernst equation in place of the free ligand concentration, and a linear plot of potential vs. total ligand concentration could be made. The average slope of a number of these titrations was 0.119 v.; the theoretical slope is 0.1183 v.

The $\text{Ag}/\text{AgP}_2\text{NO}_3$ electrode was used in combination with a double junction sleeve-type saturated calomel reference electrode whose outer sleeve was filled with a saturated potassium nitrate solution. This electrode system was used to follow the course of titrations of 1,10-phenanthroline-metal solutions with the same metal solutions. The alkali metal nitrate solutions were buffered at about pH 9 with an alkali metal borate-boric acid buffer, the transition metal solutions at about pH 4.6 with a potassium acetate-acetic acid buffer.

With the aid of an IBM 650 electronic computer the stability constants of the metal-1,10-phenanthroline complexes were calculated from the titration data. The step-wise $\log k_1$ values obtained were as follows: for H, $\log k_1 = 5.27$, $\log k_2 = 2.83$, $\log k_3 = 3.97$; for Li, $\log k_1 = 2.32$, $\log k_2 = 3.05$; for Na, $\log k_1 = 2.15$, $\log k_2 = 3.25$; for K, $\log k_1 = 2.09$, $\log k_2 = 2.84$; for Zn, $\log k_1 = 6.31$, $\log k_2 = 6.09$, $\log k_3 = 4.77$; for Cd, $\log k_1 = 5.75$, $\log k_2 = 5.09$, $\log k_3 = 3.07$; for Cu, $\log k_1 = 7.53$, $\log k_2 = 6.07$, $\log k_3 = 4.99$; for Co, $\log k_1 = 7.01$, $\log k_2 = 5.43$, $\log k_3 = 4.50$. Microfilm \$2.50; Xerox \$4.60. 86 pages.

A STUDY OF THE MAGNITUDES AND FORMS OF PHOSPHATES RETAINED IN ACID SOILS

(L. C. Card No. Mic 60-762)

James Clarence Laverty, Ph.D.

The Ohio State University, 1959

An investigation was made to determine the forms in which applied phosphates were retained in slightly acid to neutral soils and the effect of this retention on the uptake of phosphorus by oat seedlings.

A survey was made of the percentage fixation of P_2O_5 applied to 80 different Ohio soils at the rate of 80 pounds per 2 million pounds of soil. The percentage fixation was determined by comparing the amounts of available phosphorus extracted from the treated and untreated soils by the Bray acid fluoride method.

A statistical study of the results obtained in the fractionation of soil phosphates by the method of Chang and Jackson indicated that the fractionation procedure was reasonably accurate and reproducible. It should be quite helpful in determining the changes in the forms of soil phosphates which occur on the application of fertilizer phosphorus to the soils.

The amounts of applied water soluble phosphates retained in the form of aluminum phosphate were not significantly different from the amounts retained in the form of iron phosphate over a pH range of 5.0 to 7.4 in a Canfield silt loam soil. The "saloid-bound" phosphates showed a greater increase in the treated soils than in the untreated soils as the pH increased from 5.0 to 7.4. The calcium phosphates formed on the application of P_2O_5 at a rate of 240 pounds per 2 million pounds of soil did not vary appreciably with pH. The iron and aluminum phosphates formed accounted for more than 80 per cent of the phosphorus applied to this soil.

A study of the variation in the forms of soil phosphates resulting from the application of different fertilizer phosphates showed appreciable changes in the quantities of "saloid-bound" phosphates formed in the soils with the application of the different fertilizers. Changes in calcium phosphates in the soils were due mainly to unchanged fertilizer phosphates. The quantities of iron and aluminum phosphates formed in the soils did not vary appreciably when the different fertilizers were applied at similar rates of citrate soluble phosphorus. Ordinary superphosphate, triple superphosphate, Florida rock phosphate, South Carolina land rock, Virginia apatite and three special fertilizers varying in content of water soluble phosphorus were used in this investigation.

The percentage fixation of phosphorus applied at a rate of 240 pounds of P_2O_5 per 2 million pounds of soil was related to the variation in the soil phosphates formed in eight soils. "Saloid-bound" phosphate and aluminum phosphate appeared to be the forms of soil phosphate mainly extracted by the Bray acid-fluoride procedure and therefore available to plants.

Plant studies involving the uptake of phosphorus by oat seedlings in 7-day and one-month periods showed that uptake was similar from soils treated with ordinary superphosphate, triple superphosphate, special phosphate fertilizers of 16 per cent water solubility (mostly $CaHPO_4$) and South Carolina land rock when compared on the basis of citrate soluble phosphorus. Since materials with higher proportions of ammonium phosphate to give higher water solubilities decreased (or, in one study, did not affect) the uptake of phosphorus, calcium phosphates appeared to be superior to ammonium phosphates as sources of fertilizer phosphorus in moderately acid soils.

Microfilm \$2.50; Xerox \$4.80. 95 pages.

CATION-EXCHANGE BEHAVIOR OF DI-, TRI-, AND TETRAVALENT METAL IONS IN ETHYLENEDIAMMONIUM SALT SOLUTIONS.

(L. C. Card No. Mic 60-587)

Richard Thornton Oliver, Ph.D.

Iowa State University of Science and Technology, 1959

Supervisor: James S. Fritz

Batch distribution coefficients of polyvalent cations were measured between an aqueous phase containing varying concentrations of the perchlorate (or chloride) salt of ethylenediammonium ion and the ethylenediammonium form of Dowex-50 X8 (50 to 100 mesh) under equilibrium conditions. Plots of the distribution coefficients for each metal ion against ethylenediammonium ion concentration give the concentration of ethylenediammonium ion to be used as eluant in chromatographic separations.

The change in distribution coefficients for yttrium, lanthanum, aluminum, and thorium as a function of ethylenediammonium ion was not constant for different anions, the distribution coefficients being lower in chloride solutions than in perchlorate solutions. A 1:1 chloride-metal complex was observed for yttrium, lanthanum, and thorium. Stability constants were found to be 1.44, 1.65, and 2.08 respectively. No aluminum chloride complex was found. Evidence of a 3:1 complex for lanthanum was observed in 2.5 to 3 M sodium salt ($NaClO_4$ and $NaCl$) solutions.

Also studied were the changes in the distribution coefficient with temperature and with initial metal ion concentration for a di-, tri-, and tetravalent ion. The temperature study showed that the distribution coefficient increases with an increase in temperature and that the increase is linear when the logarithm of the distribution coefficient is plotted against the reciprocal of the absolute temperature. Heats of reaction were calculated from the data. They are 0.018, 0.087, 0.176 and 0.149 kcal per mole for the zinc, uranium (VI), yttrium, and thorium exchanges respectively. Both column and batch experiments showed a decrease in the distribution coefficient with an increase in the amount of metal ion initially present. The greater the charge on the adsorbed ion, the more drastic is the decrease. Microfilm \$2.50; Xerox \$3.60. 65 pages.

CHEMISTRY, BIOLOGICAL

STUDIES ON NATIVE AND DENATURED LYSOZYME

(L. C. Card No. Mic 60-492)

Sherman Beychok, Ph.D.

New York University, 1957

Adviser: Professor Robert C. Warner

This research was undertaken in an attempt to extend to the protein, lysozyme, a set of postulates which satisfactorily interpret the effect of pH and temperature on the rates of denaturation of several other proteins.

Experimental work was developed along two lines:

1. An examination of the rate of denaturation as a function of pH (1 to 6.25) at two temperatures to determine whether the nature of the variation could be accounted for in terms of the hypothesis developed by Levy and Benaglia.¹ If this hypothesis could be extended to lysozyme, an attempt would be made to identify the critical dissociating groups and to find stabilizing features common to at least several proteins.

2. An examination of some physical properties of both native and denatured lysozyme, with particular emphasis on their electrophoretic mobilities and the occurrence of any polymerized material.

The rate of denaturation of lysozyme was studied as a function of pH and temperature and two ionic strengths. The change in rate constant as pH varies from 1 to 6.3 is unusually small. Using a set of postulates referred to above, two equilibrium constants, which govern the variation of rate constant with temperature between pH 2.0 and 5.0, were evaluated. It was shown that the same postulates can, however, lead to quite different values of the constants.

Using mobilities from electrophoretic measurements, potentials at the surface of the protein molecule at each pH were calculated. These were employed in a modified form of the usual titration equation and precluded the need for knowledge of the charge at each pH. It was then possible to calculate the electrostatic factor involved in the titration of lysozyme at pH's between 2.0 and 6.0. The titration was then constructed in this pH region. The construction requires that about half of the carboxyls have an abnormally low pK_a . An explanation of this is offered in terms of a model involving hydrogen bonds between carboxyls and tyrosine residues. The extreme stability of the protein at acid pH's appears to be more or less independent of the presence or absence of these bonds.

An alternate explanation of the stability of lysozyme in acid solutions at elevated temperatures is offered in terms of the resistance to oxidation of the five disulfide bonds.

Microfilm \$2.50; Xerox \$4.60. 86 pages.

1. M. Levy and A. Benaglia, *J. Biol. Chem.*, 186, 829 (1950).

STRUCTURAL INFLUENCES ON THE STABILITY OF DIPEPTIDE-METAL ION COMPLEXES

(L. C. Card No. Mic 60-379)

John Louis Blester, Ph.D.
Syracuse University, 1959

Supervisor: Paul M. Ruoff

Proteolytic enzymes may be activated by metal ions probably through formation of substrate-metal ion complexes. Studies of systems containing the appropriate metal ions and peptides should provide data needed for detailed understanding and interpretation of the mechanisms involved.

Many studies of this type are reported in the literature using various metal ions and a large number of amino acids and peptides. But with one exception, no work has

been reported in which a systematic sequence of ligands has been employed to determine the effects of structural differences on complex stability. In this one instance a group of glycine peptides was studied in which the structural variations involved nitrogen substitutions or esterification of the terminal amino group.

In the present work a study of structural influences on complex stability constants has been made using substitutions on an α -carbon of glycylglycine to provide a systematic sequence of structural variations. Experimental data have been obtained by potentiometric titrations of appropriate solutions containing two moles of peptide per mole of metal ion.

The apparent acid dissociation constants have been determined for five dipeptides, glycylglycine, glycyl-L-alanine, glycyl-L-phenylalanine, glycyl-D-phenylalanine and L-phenylalanylglycine. The stability constants of the cobalt(II) and copper(II) complexes of these dipeptides have also been determined. The variations observed in complex stabilities have been related to the structural variations in the dipeptides. These variations are due in part to electronic influences of the groups substituted adjacent to the peptide or amino nitrogen. However, steric interferences appear to be more significant when large side chains are present adjacent to the peptide nitrogen. The largest changes in stability result from substitution adjacent to the amino nitrogen where variations in electron density significantly alter the basic strength of the terminal amino group. While most of the differences observed in stability constants are small, they appear to be real since the same order and general magnitude of change are observed with both cobalt and copper although these metals react by different mechanisms.

Samples of the copper complexes containing one mole of ligand per metal ion have been isolated with glycylglycine, glycyl-L-phenylalanine and L-phenylalanylglycine. Structures for these compounds have been suggested based upon elementary analyses for copper and nitrogen.

Microfilm \$2.50; Xerox \$5.40. 108 pages.

SOME ASPECTS OF THE INTERMEDIARY METABOLISM OF MYCOBACTERIA

(L. C. Card No. Mic 60-388)

Neil Y. Chiamori, Ph.D.
University of Southern California, 1959

Chairman: Professor Stowell

The nature of the bacteriostatic action of dihydrostreptomycin was studied by determining its effects on the O_2 uptake, the enzyme activity, and the incorporation of C^{14} into the cellular constituents.

The O_2 uptake of sensitive cells of *Mycobacteria smegmatis* suspended in a growth medium was inhibited by dihydrostreptomycin. The inhibitory influence of dihydrostreptomycin upon the O_2 uptake of *M. smegmatis* was not reversed by washing with distilled water, growth medium, saline or cysteine solution. Supplementation of a mixture of amino acids did not protect the sensitive cells from dihydrostreptomycin. Unlike the effect on the cells suspended in a growth medium, dihydrostreptomycin

produced no immediate inhibition on the oxidation of substrates such as glycerol, succinate or glucose by washed cell suspensions of *M. smegmatis*. Inhibition of oxidation by washed cell suspension was observable, but only under those conditions in which the cells were exposed to dihydrostreptomycin in the absence of substrate for a prolonged period. The washed cell suspensions from an older culture oxidized glycerol and succinate adaptively, and this type of oxidation was inhibited by dihydrostreptomycin.

These results obtained with mycobacteria are consistent with the hypothesis that dihydrostreptomycin inhibits the formation of enzymes. Since actively metabolizing cells of *M. smegmatis* such as those suspended in a growth medium have a higher metabolic rate than that of washed cells, the demand for the synthesis of enzymes would be higher. If enzyme synthesis in general is interfered with by dihydrostreptomycin, this inhibition would be expected to reflect on the oxidative activity of the cells. The dihydrostreptomycin influence which was observed in the washed cells only when the cells had been exposed to dihydrostreptomycin endogenously for a prolonged time or when washed cells from an older culture were tested might be explained on the basis of a depletion of enzymes and inhibition of the necessary resynthesis.

Oxidation of glycerol by the cell-free extracts prepared from *M. smegmatis* was demonstrated when C^{14} -glycerol was used. Dihydrostreptomycin had no effect on this oxidation. The dehydrogenase activity of cell-free extracts of *M. smegmatis* was not inhibited by the antibiotic. In these cell-free extracts, the ability to synthesize dehydrogenase might have been absent, and if only the constitutively present dehydrogenase were tested, then no inhibition would be observed in such a preparation.

On the basis of the radioactivity determination of the groups of amino acids separated on one-dimensional paper chromatograms and three amino acids separated on a Dowex-1 resin column, the uptake of C^{14} from glycerol into the protein-bound amino acids both of *M. smegmatis* and of the tubercle bacillus was markedly inhibited by dihydrostreptomycin. The measurement of the C^{14} incorporated into the lipids of *M. smegmatis* and of the tubercle bacillus indicated that if C^{14} substrate and dihydrostreptomycin were added simultaneously, there was no inhibition. If, however, the cells were preincubated with dihydrostreptomycin in the absence of substrate for a prolonged period, a strong inhibition of C^{14} uptake into the lipids was produced. On the basis of the hypothesis presented above, it appears that the enzymes which are related to the lipid metabolism of mycobacteria were present in sufficient amount, at least during the time it took to complete the experiments. In contrast to these results, the inhibition of the C^{14} uptake into the lipid was very great when the cells were exposed to dihydrostreptomycin endogenously for a prolonged time. This could be explained as a depletion of enzymes, with the subsequent resynthesis of these enzymes inhibited by dihydrostreptomycin. Microfilm \$2.50; Xerox \$7.80. 169 pages.

EFFECTS OF SELENITE UPON THE CHEMICAL NATURE OF TISSUE ABNORMALITIES IN WHITE MUSCLE DISEASE OF LAMBS

(L. C. Card No. Mic 60-314)

David Alan Cramer, Ph.D.
Oregon State College, 1960

Major Professor: J. E. Oldfield

White muscle disease (WMD) is a type of muscular dystrophy that occurs in lambs and calves when their dams are fed during gestation on legumes from certain areas. It apparently differs in several respects from myopathies which result from feeding unsaturated fatty acids or vitamin E-free diets. WMD is apparently prevented by pre-natal dietary selenium supplementation or post-natal selenium therapy and responds to vitamin E administration only under certain conditions, whereas simple vitamin E-deficiency dystrophies can be prevented or cured with vitamin E treatment and may or may not respond to selenium treatment.

WMD in lambs is a serious problem and is of great economic importance to the livestock producers of Oregon. For these reasons a program was established to study in detail the nature of WMD and to effect a cure or prevention of the disease. To do this, it was necessary to produce WMD experimentally, using natural feedstuffs, under controlled conditions. The major objectives of the present study were to determine the protective effects of selenium and vitamin E by various routes of administration and to attempt to establish the cause and nature of salt deposits in the pathogenic soft tissue calcification that usually accompanies WMD. These objectives were accomplished by (1) feeding pregnant ewes legume roughages that were known to produce WMD in the lambs and treating certain lots with selenium or vitamin E; and (2) analyzing tissues from lambs to determine resulting abnormalities. This study includes the results of feeding trials for two successive years (1957-58 and 1958-59). The study was prefaced by a review of pertinent scientific literature concerning various aspects of muscular dystrophy and specifically WMD, and mechanisms of selenium activity and bone salt formation.

The experimental feeds were subjected to proximate and mineral analyses. The proximate constituents appeared normal but mineral values were altered considerably in dystrophogenic feeds. There were wide calcium-phosphorus ratios and selenium and molybdenum levels were quite low.

Weekly injections of alpha-tocopherol or oral supplementation of vitamin E given the ewes during gestation provided essentially no protection from WMD in the lambs, whereas complete protection was obtained by drenching lambs at birth with massive doses of vitamin E. Selenium, as sodium selenite, gave complete protection either when fed to the ewes during gestation or injected into the lambs at birth. Selenium treatment produced a dramatic growth response in the lambs but vitamin E treatment did not.

Tissue analyses consisted of determinations of dry matter, ether extract, ash, cholesterol, calcium, phosphorus, magnesium, sodium, and potassium in skeletal and heart muscle, and glycoproteins and alkaline phosphatase activity in blood plasma.

There was no significant difference between affected and non-affected animals in the dry matter, ether extract, and ash contents of muscle tissues. Cholesterol, calcium, phosphorus, and sodium levels were significantly increased; magnesium remained unchanged, and potassium values were significantly decreased in muscle tissues of affected lambs. Abnormal mineral deposits appeared to be similar in composition to bone salt.

There was no significant difference in plasma alkaline phosphatase activity in ewes' blood between control and selenium supplemented lots.

Blood plasma of affected lambs showed an increase in protein-bound hexoses (glycoproteins) which indicates either an increased protein catabolism or an active transport of mucoproteins to sites of pathologic calcification of muscle tissue.

Histochemical techniques were applied to muscle tissue sections in an effort to demonstrate enzymic control of calcification of soft tissues. The results were encouraging but inconclusive. There appeared to be an increase in concentration of chondroitin sulfuric acid in the regions of abnormal tissue calcification.

Microfilm \$2.50; Xerox \$6.00. 121 pages.

THE EVALUATION OF THE FUNCTION OF PATHWAYS IN TOMATO METABOLISM

(L. C. Card No. Mic 60-316)

William Patrick Doyle, Ph.D.
Oregon State College, 1960

Major Professor: C. H. Wang

A comparative study of the metabolism of C^{14} specifically labeled acetate, pyruvate and glyoxylate in tomato fruit was carried out by means of a series of radiorespirometric and incorporation experiments. The results indicate that pyruvate is converted to acetate and then catabolized via the TCA cycle. Glyoxylic acid appears to be quite important in the synthesis of carbohydrates, glycine, serine and malic acid. Malic acid is synthesized unsymmetrically from labeled glyoxylic, suggesting the operation of the malate synthetase reaction; moreover, glyoxylic acid is incorporated into citric acid, probably via the conversion of malate to citrate. It is also possible that citric acid became labeled through the action of isocitritase. In view of these findings it might well be that the glyoxylic acid cycle in its entirety is operative in tomato fruit.

The metabolic fate of pentose was elucidated by a series of radiorespirometric and incorporation experiments using C^{14} specifically labeled gluconic acid as substrate. The pentose is apparently transformed to glucose by means of the pentose cycle; however, the labeling pattern of glucose derived from gluconate-2- C^{14} exhibited considerable radioactivity in C-2; this may be due to recycling of hexose phosphate in the pentose cycle or/and exchange reactions catalyzed by transketolase and transaldolase. Microfilm \$2.50; Xerox \$5.40. 106 pages.

THE PURIFICATION AND STRUCTURE OF SECRETIN

(L. C. Card No. Mic 60-496)

Louis Fishman, Ph.D.
New York University, 1957

Adviser: Dr. Milton Levy

Secretin, the first protein hormone to be discovered has proved difficult to isolate. Extensive purification by various solvent precipitation methods and complex formation by other investigators has not resulted in a homogeneous secretin.

Attempts were made to isolate a homogeneous secretin by applying chromatographic and electrophoretic techniques to a highly purified secretin (Lilly). Paper chromatography with the solvents commonly used for the separation of amino acids and peptides failed to fractionate the Lilly secretin. Chromatography with columns of the ion exchange resins IRC-50 and Dowex - 50 using as eluants 0.01N to 4N HCl and various phosphate buffers from pH 5.9 - 7.2 gave poor separation of the starting material. The material recovered from several of these columns was tested for secretin activity on dogs with pancreatic duct fistulas. No active material was found.

The Lilly secretin was subjected to paper electrophoresis at pH 3.00. This gave an elongated band of active material which moved towards the cathode. The residual material was inactive and remained near the origin. The extracts of the active material from the filter paper contained amine impurities which rendered the extracts unsuitable for structural studies.

Electrophoresis on potato starch blocks using pH 3.00 phosphate buffer gave the same separation pattern as paper but very poor recoveries and loss of all biological activity. When Geon 426 was used as the supporting medium for electrophoresis recoveries of up to 85% of highly active material could be achieved. At pH 4.17 the pattern of separation was the same as with paper. At pH 3.00 there occurred a reversal of pattern which was probably due to electro-osmotic effects. The most complete separation of secretin from the impurities occurred at pH 7.45 where the active secretin moved towards the cathode while the impurities barely moved from the origin in the direction of the anode.

While the active material appeared in an elongated band upon initial electrophoresis, repeat ionophoresis at pH 7.45 gave a compact band which migrated towards the cathode. This indicates the possibility that the active secretin is bound to the impurities. These complexes are split by the applied e.m.f. during ionophoresis. The activity of the purified secretin was 55 clinical units/mg., a five fold increase over the starting material.

Acid hydrolysates of the active secretin were analyzed for amino acids using Dowex - 50 columns with 2N and 4N HCl as eluants. The resulting peaks of amino acids were estimated quantitatively by the ninhydrin reaction and identified by paper chromatography. Arginine and histidine were identified by specific color reactions. The amide NH_2 was determined by a micromethod using Conway dishes.

Hydrolysis with carboxypeptidase showed a single "C" terminal amino acid, isoleucine and dinitrophenylation studies showed a single "N" terminal amino acid, arginine.

The occurrence of single "C" and "N" terminal amino acids along with the good molar ratios found seem to indicate a homogeneous secretin. The above findings indicate the following empirical formula; iso - val-(asp, glut₅, glyc₂, ala₄, ser+thre₄, val₃, iso₁, leu₄, tyr₁, hist₁, arg₁, lys₃, (CONH₂)₅)-arg.

The sum of the constituent amino acids gives a minimal molecular weight of 4,030 which agrees with the ultracentrifuge value reported by Svedburg for a different secretin preparation and is probably the correct molecular weight.

The isoelectric zone of the pure secretin was found to be between pH 10 - 11 by mobility studies with paper electrophoresis at various pHs. This value agreed with the isoelectric zone calculated from the constituent amino acids. Microfilm \$2.50; Xerox \$4.20. 77 pages.

THE ISOLATION AND PURIFICATION OF THE ALANINE-ACTIVATING ENZYME FROM RAT LIVER

(L. C. Card No. Mic 60-600)

Jack Goldstein, Ph.D.
Cornell University, 1959

The purification of the alanine-activating enzyme from rat liver is described. It is found that diethylaminoethyl-cellulose column chromatography of the twice precipitated "pH 5 enzymes" fraction produces an approximately 500 fold purified alanine-activating enzyme free of adenylate kinase. Further purification can be obtained by the use of very small amounts of diethylaminoethyl-cellulose and by ammonium sulfate fractionation. A method for the separation of other amino acid activating enzymes is also described.

The purified alanine-activating enzyme is very unstable. Approximately half of its activity is lost during storage for three days at 0°C. Freezing and thawing the solution results in immediate loss of half of the activity. The lyophilized enzyme is stable for at least six weeks, however half of the enzymatic activity is lost during lyophilization. The addition of Cohn fraction V human serum albumin to the purified alanine-activating enzyme solution is found to stabilize it during the freezing, thawing and lyophilization procedures.

The enzyme is inhibited by parachloromercuribenzoate and is sensitive to oxidation by air. Sulfhydryl compounds and vitamin B₁₂ give no protection. Dialysis of the highly purified enzyme results in complete loss of activity after two hours. Addition of the outside solution to the material in the dialysis sack does not restore any activity.

The effects of ribonucleic acid and ribonuclease upon the amino acid activating reaction were studied. The reaction is inhibited by rat liver "soluble" fraction ribonucleic acid, and this inhibition is completely reversed by ribonuclease. Yeast ribonucleic acid has no effect.

Microfilm \$2.50; Xerox \$3.80. 68 pages.

THE METABOLISM OF ESTRADIOL-17 β -16-C¹⁴ BY ENZYMES OF RAT LIVER

(L. C. Card No. Mic 60-335)

Warren G. Hansen, Ph.D.
St. Louis University, 1959

The incubation of estradiol-17 β -16-C¹⁴ with slices or a fortified homogenate prepared from rat liver results in the enzymatic conversion of the hormone into a number of products. Since carbon-14 was used as a tracer, it has been possible to separate them into the following fractions: 1) protein-bound, 2) soluble in petroleum ether, 3) soluble in ethyl ether, 4) conjugates with sulfuric acid, 5) conjugates with glucuronic acid, 6) extractable from ether with aqueous bicarbonate, 7) soluble in water and butanol, 8) soluble in water but insoluble in butanol.

Fractionation of the liver slices at the end of an incubation into cytological components has revealed that metabolites of the steroid were bound to the proteins of the nuclei, mitochondria, microsomes, and soluble supernatant. After hydrolysis of the labeled proteins with proteolytic enzymes (papain, pepsin, rennin, trypsin, and chymotrypsin), about 60 per cent of the radioactivity could be extracted into butanol from its aqueous solution. This butanol extract was chromatographed on a partition column, a silica gel column, and a starch column. The radioactive eluate from the starch column was dried and leached with ether. After removal of the ether the dried residue was dissolved in benzene and chromatographed on silica gel. Mixtures of benzene and ethyl acetate eluted a small amount of pink oil in which the radioactivity was purified 61-fold over the original protein. It contained about 0.5 per cent steroid by weight. The absorption spectrum of this oil revealed a band at 566 m μ , a band at 528 m μ , and an intense, narrow band at 399 m μ . These correspond to the alpha, beta, and gamma (Soret) bands of heme and its derivatives. The material was soluble in organic solvents and insoluble in water. The data are not inconsistent with the view that a metabolite of estradiol may have been conjugated with a lipoprotein bearing one or more heme residues.

Chromatography of the petroleum ether extract on silica gel revealed that 64 per cent of this radioactivity is contained in a single fraction that is much less polar than estrone. Small amounts of other more polar metabolites were also present.

Chromatography of the ether-soluble fraction has provided evidence for the existence of 21 metabolites in this fraction. The chief metabolite in this fraction has been isolated in crystalline form and identified by isotopic dilution and paper chromatography as estrone. Estrone makes up 40 per cent of the ether-soluble radioactivity or about 14 per cent of the total radioactivity.

The radioactivity in the bicarbonate extract may be acidic. Chromatography on a partition column has provided evidence for the existence of two products in this fraction.

About 60 per cent of the water-soluble radioactivity can be extracted into butanol at pH 2. Chromatography of an aqueous solution of this butanol-extractable radioactivity on a cation exchange resin and a partition column has provided evidence for the existence of at least 6 metabolites in this fraction.

Microfilm \$3.00; Xerox \$10.60. 232 pages.

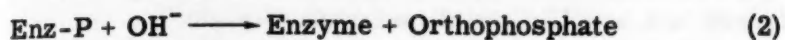
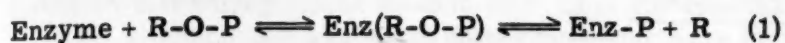
THE ENZYMATIC DEPHOSPHORYLATION OF GLUCOSE-6-PHOSPHATE AND FRUCTOSE-1,6-DIPHOSPHATE.

(L. C. Card No. Mic 60-465)

Louis Frederick Hass, Ph.D.
Duke University, 1959

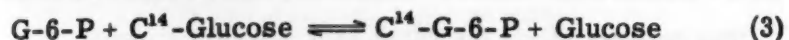
Supervisor: William L. Byrne

The following mechanism was proposed as a model for specific phosphatases:



This mechanism was found to provide an adequate explanation for the inhibition of phosphoserine phosphatase by serine and to account for the incorporation of radioactive serine into phosphoserine (*J. Biol. Chem.*, 234, 113 (1959); *Biochim. et Biophys. Acta*, 28, 222 (1958)). An attempt to relate the proposed mechanism to glucose-6-phosphatase and hexosediphosphatase led to the following results.

Hepatic microsomal G-6-Pase, prepared from normal and alloxan-diabetic rats, was observed to catalyze the following exchange:



This exchange was found to be quantitatively correlated with the inhibition of the hydrolytic activity of G-6-Pase by glucose. Thus, the number of μ moles of orthophosphate (Pi) whose liberation was prevented by glucose was equal to the number of μ moles of C^{14} -glucose incorporated into G-6-P. Under identical conditions, Pi^{32} was not incorporated into G-6-P. Similar investigations with C^{14} -fructose indicated that the enzyme had definite but slight transferase activity. All of these observations were found to be consistent with the proposed mechanism. Lineweaver-Burk plots of enzymatic activity in the presence of several concentrations of glucose yielded a series of lines with increasing ordinate intercepts and slightly increasing slopes. Steady state kinetic treatment of the proposed mechanism gave a reciprocal velocity expression which was in good agreement with the described plots. No difference was found between the kinetic and thermodynamic parameters (K_m , K_s , $K_i(\text{Glu})$, $K_i(\text{Pi})$, and ΔF (binding)) of the enzymes prepared from normal and diabetic animals. Pi was found to compete with G-6-P for the active site of the enzyme. Further inhibition studies indicated that only those hexoses or hexose analogs closely resembling glucose appreciably inhibited enzymatic activity.

Before attempting to investigate the mechanism of action of hexosediphosphatase, a survey was made of the enzyme's activity in rat and rabbit liver. This survey led to the discovery of neutral hepatic hexosediphosphatase.

Hexosediphosphatase activity in several liver fractions was found to manifest two pH optima, one occurring at pH 6.0 - 6.5 and the other at pH 8.5 - 9.0. Fractionation of rat liver proteins with DEAE-cellulose demonstrated that the two pH optima were due to two structurally similar hexosediphosphatases. However, preincubation of crude rabbit liver extract at 37°C and pH 4.4 selectively destroyed activity at pH 6.5 and produced a new optimum with increased activity at pH 9.5 - 10.0. Heat treatment at 64°C and pH 4.4 produced an analogous effect. During the initial stages of preincubation, it was observed that for

each unit of activity which disappeared at pH 6.5, two units appeared at pH 9.5. This correlation suggests the conversion of neutral to alkaline hexosediphosphatase.

Neutral hexosediphosphatase was found to specifically cleave orthophosphate from carbon one of fructosediphosphate (FDP). The enzyme manifested little or no activity toward sedoheptulosediphosphate, fructose-1-phosphate or fructose-6-phosphate. The K_m for FDP was estimated to be 2.9×10^{-5} M. Neutral hexosediphosphatase required either Mg^{++} ($K_m = 1.5 \times 10^{-3}$ M) or Mn^{++} (2.5×10^{-5} M) for activity. At concentrations in excess of 1.25×10^{-4} M, Mn^{++} was found to be inhibitory.

Microfilm \$2.50; Xerox \$5.60. 112 pages.

ENZYMIC REDUCTION OF THE α , β -UNSATURATED KETONE STRUCTURE OF RING A OF PROGESTATIONAL STEROIDS.

(L. C. Card No. Mic 60-345)

Hal Gilbert Lankford, Ph.D.
St. Louis University, 1959

A procedure was devised for determining the extent of reduction of the α , β -unsaturated ketone structures of ring A of some progestational steroids by whole homogenates of rat liver. Extracts of the incubation mixtures were purified for assay by ultraviolet spectrophotometry by chromatography on silica gel.

Addition of the co-factor, DPN, to the homogenates resulted in small increases in the amount of reduction of 17 α -ethynyltestosterone, 17 α -ethynyl-19-nortestosterone and 17 α -methyl-19-nortestosterone, which is in contrast to its marked stimulatory effects on the reduction of progesterone. Homogenates to which the co-factor, TPN, had been added demonstrated enhanced activity in reducing ring A of all of these steroids.

Comparative studies were made of the rates of reduction of the α , β -unsaturated ketone structures of the progestational steroids by microsome-supernatant fractions from homogenates of rat liver. The rates of reduction of ring A in order of increasing magnitude for the steroids studied are 17 α -ethynyltestosterone, 17 α -methyl-19-nortestosterone, 17 α -ethynyl-19-nortestosterone, and progesterone. Microfilm \$2.50; Xerox \$6.40. 132 pages.

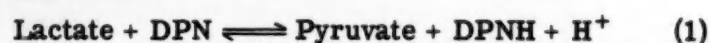
A STUDY OF SOME INHIBITORS OF LACTIC DEHYDROGENASE

(L. C. Card No. Mic 60-411)

William Brewster Novoa, Ph.D.
Duke University, 1959

Supervisor: G. W. Schwert

The enzyme, lactic dehydrogenase, catalyzes the following reaction:



In the above reaction, the initials DPN and DPNH stand for the oxidized and reduced forms of the coenzyme,

diphosphopyridine nucleotide, respectively. It has been proposed previously (1), that the reaction occurs through a sequential series of steps. The enzyme first reacts with the coenzyme to form a binary complex. This complex then reacts with the substrate to form a ternary complex which is the active intermediate in the reaction between substrate and coenzyme.

This mechanism has been investigated by means of the inhibitors oxalic acid and oxamic acid. The latter is the mono-amide of oxalic acid.

The results of inhibition kinetics can be explained on the basis of the above mechanism by assuming that each inhibitor combines with both the enzyme-DPN complex and the enzyme-DPNH complex. In addition, the inhibitors form weak complexes with the free enzyme. Oxamate is most firmly bound to the enzyme-DPNH complex, so that it acts as an inhibitor primarily competitive with pyruvate. Oxalate is most firmly bound to the enzyme-DPN complex, so that it acts as an inhibitor primarily competitive with lactate.

All the dissociation constants for both inhibitors were found to increase with pH, the increase being especially sharp between pH 9 and 10.

Oxamate was found to have a specific quenching effect on the fluorescence of DPNH in the enzyme-DPNH complex. It was concluded that this is the result of the formation of a ternary complex analogous to the activated complex formed from enzyme, DPNH, and pyruvate.

Kinetic studies with pyruvate furnished evidence for the existence of a ternary complex of pyruvate with enzyme and DPN. It is probable, but not certain, that this complex is the cause of the substrate inhibition found at high concentrations of pyruvate.

The binding of oxamate to the enzyme-DPNH complex, and of oxalate to the enzyme-DPN complex was examined by the ultracentrifugal sedimentation technique of Chanutin et al. (2). It was shown that 3.6 moles of oxamate and 4.0 moles of oxalate are bound to every 135,000 g. of protein. Previous workers have found the same values for the binding of DPN (1) and DPNH (3) to the enzyme. The experiments yielded inhibitor dissociation constants which compared favorably with those obtained by kinetic means.

Binding of inhibitors to the enzyme in the absence of coenzyme could not be detected. Since previous experimenters have shown that DPNH (4) and DPN (1) are bound to the free enzyme while lactate and pyruvate are not (1), these findings verify the proposed reaction mechanism.

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Microfilm \$2.50; Xerox \$4.00. 73 pages.

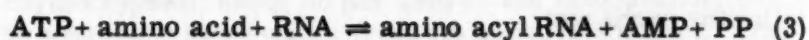
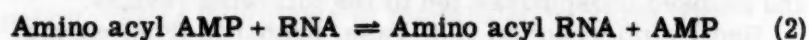
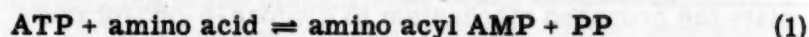
THE ENZYMATIC SYNTHESIS OF AMINO ACYL RNA COMPOUNDS

(L. C. Card No. Mic 59-6941)

Edward James Ofengand, Ph.D.
Washington University, 1959

Chairman: Professor Paul Berg

The activation of amino acids by their conversion to amino acyl adenylates (equation 1) is known to occur in *Escherichia coli*. The present investigation has revealed that such activated amino acids are subsequently transferred to a specific, small molecular weight fraction of ribonucleic acid (equation 2). The over-all reaction (equation 3), therefore, results in the synthesis of amino acyl RNA from free amino acids and RNA, with the parallel conversion of adenosine-5'-triphosphate (ATP) to adenosine-5'-monophosphate (AMP) and inorganic pyrophosphate (PP):



The present study indicates that a single enzyme catalyzes both the formation of the amino acyl adenylate (reaction 1) and the transfer of the amino acid to RNA (reaction 2), and that there are separate enzymes for each amino acid.

As shown above, the over-all reaction is reversible and in the presence of PP^{32} , AMP, and amino acyl RNA, there is a net synthesis of ATP ($\text{ARPP}^{32}\text{P}^{32}$) which is equivalent to the amount of amino acyl RNA which disappears. With valine, the equilibrium constant at pH 7.0 was 0.32.

The amino acid is bound to the RNA by an ester linkage between the carboxyl group of the amino acid and either the 2'- or 3'-hydroxyl group of the ribose of that terminal nucleotide of the RNA chain which has an unesterified 3'-hydroxyl group. Assuming that the polynucleotide is unbranched, this finding means that there can be only one amino acid binding site per RNA molecule.

The RNA fraction which serves as the acceptor of amino acids has been purified from dried cells of *E. coli* by detergent extraction, salt and ethanol fractionation, and either adsorption and elution from Norite, or fractionation on ECTEOLA-cellulose columns. Studies on the biological and physical properties of this RNA have led to the following conclusions.

1. No more than 10 per cent of the RNA of *E. coli* can function as an acceptor of amino acids. The rest of the RNA, which is of high molecular weight, is inactive. High molecular weight RNA from other sources, and enzymatically prepared polynucleotides are also inactive.

2. There are specific binding sites on the RNA for each amino acid. Since there are also separate RNA molecules for each amino acid, RNA chains must be differentiated from each other with respect to their ability to accept a particular amino acid. In support of this deduction, it was possible by appropriate fractionation procedures to effect a partial physical separation of

the RNA molecules binding leucine from those binding valine. However, since it was found that all acceptor RNA chains terminate in adenylic acid at the acceptor end, they must be differentiated at a point other than the binding site.

3. The maximum molecular weight of acceptor RNA, determined by end group analysis, was 31,000 to 34,000. A minimum value of 17,000 to 22,000 was estimated from the sedimentation rate of acceptor RNA in the ultracentrifuge, by assuming that the RNA behaved as a rigid, impermeable, anhydrous sphere.

4. The nucleotide composition of the most purified acceptor RNA has been determined and found to differ markedly from that for the total RNA of *E. coli*. Thus the ratios found for cytidylic, guanylic, uridylic and adenylic acids are 1.14 : 1.25 : 0.82 : 0.78, respectively. Microfilm \$2.50; Xerox \$7.40. 159 pages.

MECHANISM OF OXIDATION OF REDUCED PYRIDINE NUCLEOTIDE ANALOGS BY RIBOFLAVIN

(L. C. Card No. Mic 60-592)

Clarence Henry Suelter, Ph.D.

Iowa State University of Science and Technology, 1959

Supervisor: David E. Metzler

Riboflavin as a coenzyme functions in many biological oxidation processes. One interesting reaction catalyzed by riboflavin containing enzymes is the oxidation of reduced diphosphopyridine nucleotide (DPNH) in the respiratory sequence of mitochondria.

This study was, therefore, undertaken to elucidate the mechanism of the oxidation of DPNH by riboflavin with the hope of gaining some insights into the mechanism of oxidative phosphorylation.

Because of the complexity of the DPNH molecule, an analog, 1-propyl-1,4-dihydronicotinamide was used.

The dihydri-riboflavin formed during the oxidation of NPrNH was immediately reoxidized by oxygen in solution so that 1st order kinetics were observed aerobically. The reaction was also 1st order in riboflavin. The rate of the reaction increased with increasing ionic strength and decreased in nonpolar solvents. The riboflavin anion (pK 9.95) does not function as an oxidizing agent, whereas, the cation (pK 0.12) appears to be a stronger oxidizing agent than the neutral riboflavin. The following table summarizes the rates of oxidation and the dissociation constants of riboflavin and several derivatives.

Substituents on the pyridine ring of the reduced analog which decrease the electron density of the ring retard the rate of oxidation. The deuterium isotope effect $\frac{k_2 H_2}{k_2 D_2}$ was 3.16 ± 0.05 . Attempts to demonstrate a bimolecular complex between DPNH or NPrNH and riboflavin were not successful. Furthermore, riboflavin exerts no stereospecificity in the non-enzymatic oxidation of DPNH labeled stereospecifically with tritium at the "4" position of the nicotinamide moiety.

The data are all interpreted in terms of an ionic

Compound	pK ₁ ^a	pK ₂ ^b	Rate ^c pH 6.8	Rate pH 10.2
Riboflavin (6,7-dimethyl-9-ribityl isoalloxazine)	0.12	9.95	1	1
Riboflavin-5'-phosphate	0.05	10.32	1.5	0.9
Flavin adenine dinucleotide	d	d	0.44	d
6,7-dimethyl-9-formylmethyl isoalloxazine	3.50	e	2	e
Lumiflavin (6,7,9-trimethyl isoalloxazine)	d	d	0.9	0.8
3-methyl lumiflavin (3,6,7,9-tetramethyl isoalloxazine)	0.18	f	0.8	2.0

^a Dissociation of protonated flavin

^b Dissociation of no. 3 hydrogen of flavin

^c Relative rates with riboflavin given a rate of 1 at pH 6.8 and 10.2

^d Not measured

^e Unstable at high pH

^f Has no dissociable hydrogen

mechanism (substituent, solvent, and pH effect) in which a hydride ion is removed from NPrNH in the rate limiting step (deuterium isotope effect). Since 3-methyl lumiflavin at pH 10.2 oxidizes NPrNH at 92% of the rate observed at pH 7, the addition of a proton to riboflavin in the final step is a rapid reaction.

As is well known with DPNH or its analogs, NPrNH is unstable in acid solutions. The rate of this decomposition was found to be more rapid in phosphate, acetate or formate buffers than in nicotinamide, pyridine or histidine buffers. The decomposition product when formed in phosphate buffer could then be reoxidized by riboflavin to obtain the oxidized analog. The mechanism and implications of these reactions are discussed.

Microfilm \$2.50; Xerox \$4.60. 90 pages.

THE DENATURATION AND TITRATION OF CONALBUMIN

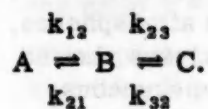
(L. C. Card No. Mic 60-530)

Arnold Wishnia, Ph.D.

New York University, 1957

Adviser: Dr. Robert C. Warner

The kinetics of denaturation of conalbumin was studied as a function of pH and temperature. In the interval pH 3.2 to 4.2, at temperatures of 0°, 5°, 10°, and 28.7° C., and at ionic strength 0.10 in formate, the results at a given pH could be interpreted in terms of the reaction



The somewhat unusual variation of the rate constants

k_{12} , k_{21} , k_{23} , and k_{32} , with pH, is explained according to the theories of Steinhardt and Levy. It is assumed that there are 18 critical basic groups on the protein, the association to which of 10 or 18 protons results in two particularly unstable species. 16 sites are definitely carboxyl groups, with apparent pK from 3.8 to 4.4 depending on the temperature and the reaction studied. The slight variation of pK for 16 essential identical groups concords with the unique features of the carboxyl titration curve. The remaining two sites are more acid, and may be α -COOH types.

The temperature variation of the derived rate constants and pK's shows that the equilibrium $A=B$ has low values of ΔH and ΔS , while the subsequent reactions involve larger changes in heat content and entropy. The active complexes for the first reaction may be slightly expanded. The entropy increase on denaturation and the striking decrease of electrostatic interaction in species C are best interpreted through a volume increase, in agreement with the data of Phelps and Cann obtained from sedimentation, viscosity, and osmotic pressure studies.

The phenomenon of release of masked groups is clearly observed below pH 4, where 11 carboxyls appear, and above pH 11, where seven phenolic and 33 other, probably mostly guanidinium, groups become titratable. At least some of these need not be masked, but appear when their apparent pK is lowered by structural changes in the protein leading to decreased electrostatic effects.

The intrinsic pK of many of the acid groups in conalbumin is lower than usual. The electrostatic factor w , at $\mu = 0.10$, is $0.027 \pm .002$ for imidazole, ϵ -amino, and phenolic groups, compared to the theoretical value of 0.033 for a sphere. The w for carboxyls is uniformly lower, only half the theoretical value, at the three ionic strengths studied. This is attributed to the chloride binding inferred from electrophoretic studies by Warner and Weber.

Microfilm \$2.50; Xerox \$4.60. 90 pages.

CHEMISTRY, INORGANIC

SOME ELECTROCHEMICAL INVESTIGATIONS WITH DILUTE BISMUTH AMALGAMS USED AS DROPPING ELECTRODES

(L. C. Card No. Mic 59-5156)

Robert E. Biggers, Ph.D.
Princeton University, 1958

Ionic complexation studies at dropping Bi amalgam electrodes (DAE) indicated that 10^{-3} and 10^{-4} M Bi amalgams were not stable (previously unreported). Under identical conditions, decreasing anodic currents were observed with increasing time, and subsequently no electro-oxidation of Bi to the ionic state occurred. Homogeneous amalgams were prepared, stored, and used in a specially designed apparatus, and in O_2 free atmospheres, but decompositions were still observed. Analyses showed that the decomposed amalgams were still homogeneous. The kinetics of the amalgam decomposition were investigated for times ranging up to about 30,000 minutes.

The complete literature concerning dropping amalgam electrodes and other literature pertinent to Bi and amalgams is reviewed. First order rate constants of about $10^{-4} \text{ min.}^{-1}$, and $t_{0.5}$ values of about 6600 min. were obtained for the dilute amalgams. Induction periods of about 1000-1200 min. were observed.

The results are discussed from two points of view: nucleation, growth and aggregation; and compound formation. Characteristics of the decomposition process are discussed in terms of: vapor-pressure, magnetic and diffusion studies, the structure of liquid mercury, and what is generally known about amalgam systems. The data are more nearly explained by the nucleation-aggregation hypothesis. Compound formation was shown to be unlikely.

The oxidation of Bi from a DAE into numerous complexing media was studied (EDTA, Thionalide, NH_3-NH_4Cl , $NH_3-NH_4C_2H_3O_2$, H_2S , NO_3^- , SO_4^{2-} , ClO_4^- , PO_4^{3-} , and acetate-tetraborate). Amalgam polarography is useful because information concerning the formation of complexes and precipitates can be obtained under conditions which are otherwise unobtainable. This is useful for heavier elements which may be considerably hydrolyzed, and whose solutions are complicated by polymerization.

The formation of simple hydroxylated Bi species and Bi^{+3} hydrolysis was studied using anodic and cathodic polarography in buffered and unbuffered solutions over a very wide pH range. The effects of amalgam pressure and methylcellulose on the oxidation potentials and diffusion currents were studied. Values of K_{ins} for $Bi(OH)^{+2}$, $Bi(OH)_2^+$ (1st K), $Bi(OH)_3^{+2}$, and $Bi(OH)_3$ (K_3) were measured. K_1 and K_2 for $Bi(OH)_3$, and the K_4 for $Bi(OH)_5^{+2}$ were calculated. These data are compared with the fragmentary data known for As and Sb.

Polarographic (amalgam) and spectrophotometric studies were made of Bi - NO_3^- complexation, and the K_{ins} for $Bi(NO_3)^{+2}$ and $Bi(NO_3)_3$ were obtained. The dissociation of weak complexes (nitrate, sulfate, acetate, etc.) can be measured under conditions where hydrolytic effects are absent, by using amalgams. Using the Bi-DAE, the K_{ins} (5×10^{-28}) of Bi-Versenate was measured for the first time. Theoretical implications in equations developed for amalgam and for conventional polarography were critically reviewed.

Extensive anodic and cathodic studies of Bi and Hg sulfide and hydrosulfide complexation were made in acidic and basic solutions over a very wide pH range. The K_1 and K_2 for H_2S , and the discordant literature on the K_{sp} values for Hg and Bi sulfides was critically reviewed. A new value of 3.2×10^{-62} was measured and is proposed for Bi_2S_3 . Probable reasons for the differences are given. Effects of age and preparation of sulfides on structural modifications are discussed. Application of amalgam techniques (free from aging problems) permits the initial formation of metallic sulfides to be observed, and should be useful for many other metals. The K_{sp} of $Hg_2(HS)_2$, Hg_2S , HgS , and mercurous thionalate were also measured.

An extensive study of the effect of Cl^- on the irreversible bismuth perchlorate system was carried out using anodic (amalgam) and cathodic polarographic techniques. With a dropping amalgam-dropping mercury electrode couple that was devised with a simple electronic circuit, this kind of data is more easily obtained than formerly. The anions studied were: Cl^- , Br^- , I^- , F^- , NO_3^- , Citrate,

Tartrate, $C_2H_3O_2^-$, BO_3^{3-} , SCN^- , SO_4^{2-} , and PO_4^{3-} . Bi-halide complexation is reviewed and the K_{ins} for $BiCl_2^+$ was measured, as was the K_{ins} (previously unreported) for the complexes BiF_2^+ and BiF_6^{3-} . The results are discussed in terms of adsorptive effects, electrocapilarity, and complexation. The effect of tartrate is unique. Uses for this type of experimental technique and electrode couple are discussed.

Microfilm \$6.50; Xerox \$22.40. 509 pages.

A STUDY OF THE THERMAL DECOMPOSITION OF THE CARBONATES AND OXALATES OF SOME RARE EARTH ELEMENTS BY DIFFERENTIAL THERMAL ANALYSIS

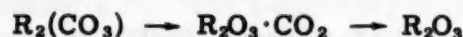
(L. C. Card No. Mic 60-545)

Carl Barnes Bishop, Ph.D.
Michigan State University, 1959

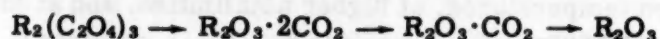
The thermal decomposition of the carbonates and oxalates of lanthanum, cerium, neodymium, praseodymium, samarium and yttrium was studied by the differential thermal analysis technique.

A description for the construction and operation of equipment for differential thermal analysis was given.

The carbonates were prepared by decomposing solutions of the trichloroacetates of the elements studied. Only yttrium indicated a stable hydrate. The other carbonates were anhydrous after air drying for forty-eight hours. The carbonates generally decompose as indicated by the equation



The oxalates were precipitated from hot dilute nitrate solutions by dilute oxalic acid. Decahydrates were formed for all the rare earth oxalates studied. Lanthanum also formed a hexahydrate which would decompose to a tetrahydrate. Intermediate hydrates were identified from the decahydrates of neodymium, samarium and yttrium. The oxalates generally decomposed as indicated by the equation



A reversible crystal conversion at 960° C. was found for praseodymium oxide (Pr_6O_{11}).

X-ray powder diffraction patterns, chemical analysis, and microscopic photography were used to identify the compounds. Microfilm \$2.50; Xerox \$5.60. 114 pages.

THE PREPARATION AND PROPERTIES OF SOME FLUOROMETALLATES

(L. C. Card No. Mic 59-6935)

David Scott Crockett III, Ph.D.
University of New Hampshire, 1960

A description is given of the preparation of seventeen ammonium fluorometallates by the reaction of the metal bromide with ammonium fluoride in methanol. The formation of the metal bromides as methanol solutions by the

direct bromination of the metal in methanol is also described. The preparation of fluorometallate complexes is further extended to include the preparation of potassium, rubidium, and cesium fluorometallate complexes, and the products formed are compared with the stoichiometry of the ammonium complexes formed in analogous reactions. The complexes prepared include those of the following metals, bismuth, cadmium, cobalt, copper, manganese, zinc, magnesium, iron (I), iron (II), nickel, germanium, tin, thorium, aluminum, titanium, indium, and zirconium.

The structural properties of some of the fluorometallates are also considered. From x-ray powder photographs it has been possible to relate the structure of the ammonium and rubidium complexes to the known structures of the potassium complexes, and in some instances to show them to be isomorphous. The following cobalt, zinc, and manganese complexes have been shown to be cubic: NH_4CoF_3 , $a = 4.129$; $KCoF_3$, $a = 4.078$; $RbCoF_3$, $a = 4.141$; NH_4MnF_3 , $a = 4.238$; $KMnF_3$, $a = 4.192$; $RbMnF_3$, $a = 4.243$; NH_4ZnF_3 , $a = 4.115$; $KZnF_3$, $a = 4.057$; $RbZnF_3$, $a = 4.116$. The corresponding copper complexes appear to be tetragonal with the following cell dimensions: NH_4CuF_3 , $a = 4.31$, $c = 3.89$; $RbCuF_3$, $a = 4.24$, $c = 3.94$.

The thermal decomposition of some of the ammonium fluorometallates has been studied and the products identified by means of chemical analysis or x-ray powder photographs. Decomposition temperatures observed are 290°C., 300°C., and 310°C., for NH_4CoF_3 , NH_4CuF_3 , and NH_4MnF_3 respectively.

Infra-red spectral data is given for the ammonium complexes of cobalt, manganese, zinc, iron (III), nickel, cadmium, and copper (II). The possibility of hydrogen bonding in these complexes is discussed on the basis of the infra-red spectra and x-ray diffraction data.

In the appendix is included values for the interplanar spacings "d" and intensities for a number of the complexes prepared. Also included in the appendix is a description of a computer program for the calculation of interplanar spacings from cell data, and a note concerning the use of Halocarbon oil as a mulling agent for infra-red spectra. Microfilm \$2.50; Xerox \$4.20. 79 pages.

PREPARATION OF A COMPLEX POTASSIUM RHENIUM HYDRIDE AND ITS BEARING ON THE NATURE OF THE -1 OXIDATION STATE OF RHENIUM

(L. C. Card No. Mic 60-12)

Alvin P. Ginsberg, Ph.D.
Columbia University, 1959

It is shown that reduction of dilute solutions of potassium perrhenate with sodium amalgam in a Jones reductor results in the formation of a rhenium species for which the ratio $n = \frac{\text{meq reducing power}}{\text{millimoles Re}}$ is greater than 10.

This species is seen to be probably identical with the one resulting from the reduction of potassium perrhenate with potassium metal in ethylenediamine - water solution. The product of the latter reaction is isolated in pure form

Lithium ferrate was prepared by a method similar to that used for sodium ferrate but the purity of the lithium ferrate was much lower, being slightly more than 15%.

The lower purity of rubidium and cesium ferrates as compared to potassium ferrate was due to the limited quantities of cesium and rubidium hydroxide that could be prepared. Sodium ferrate was difficult to prepare in high purity because of its high solubility in sodium hydroxide solutions, its solubility in alcohol, and its preparation from concentrated solutions. Lithium ferrate gave the lowest purity because of its greater solubility, because of the comparatively low solubility of lithium hydroxide and lithium carbonate, because of its solubility in alcohol, and because of its preparation from its concentrated solutions.

In metathetical reactions the properties of the alkali metal ferrates are very similar to the alkali metal chromates, but in redox reactions the ferrates are much more powerful oxidizing agents, as shown by their low stabilities. The stability of the alkali metal ferrates appears to increase with an increase in ion size.

The preparation of barium ferrate by the reaction of barium chloride and potassium ferrate in solution is described. A modified chromite method of analysis gave the most consistent and reliable results. A sample of barium ferrate of purity greater than 86% was obtained.

A strontium ferrate sample more than 59% pure was prepared by reacting a saturated strontium chloride solution with solid potassium ferrate.

The difficulty in preparing the alkaline earth metal ferrates increased with decreasing ion size. This is due to two factors, the greater solubility of the lighter alkaline earth metal ferrates and the polarizing ability of the lighter and smaller ions. The insolubility of the hydroxides and carbonates of these alkaline earth metals leads to greater contamination and, therefore, to greater impurity of the alkaline earth metal ferrates produced.

The other metal ferrates that were prepared were cadmium ferrate, zinc ferrate, and lanthanum ferrate. The preparation of silver, cupric, mercuric, lead, thallous, aluminum and ammonium ferrates was attempted without success. Microfilm \$2.50; Xerox \$6.80. 145 pages.

1. Thompson, G. W., Ockerman, L. T., and Schreyer, J. M., *J. Am. Chem. Soc.*, 73, 1379 (1951).

SYNTHESES AND STUDIES OF B AND N SUBSTITUTED BORAZINES

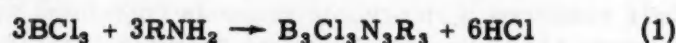
(L. C. Card No. Mic 60-336)

Daniel Thomas Haworth, Ph.D.
St. Louis University, 1959

Although borazine, $B_3H_3N_3H_3$, was isolated in 1926 by A. Stock, relatively little chemistry is available on its derivatives. While some advancements have been made in recent years, the preparation and characterization of a wider variety of borazines is necessary for the progress of many investigations which can further elucidate the chemistry of the borazine ring. This dissertation describes efforts to develop convenient methods for the

synthesis of boron and nitrogen substituted borazines. Also described is the isolation of an intermediate in these preparations, the reaction of borazine with alcohols, the preparation of a reduced borazine analog, and observations on the thermal stability of borazine and several substituted borazines.

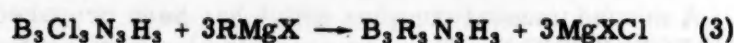
It has been demonstrated that the synthesis of B-trichloro-N-trialkylborazines and B-trichloro-N-triarylborazines can easily be accomplished by an improvement and extension of earlier methods involving the reaction of trichloroborane with amines or amine hydrochlorides. The isolation



of borazines in better than 60 percent yields (equation 1) has been obtained where R is methyl, ethyl, cyclohexyl, phenyl, p-tolyl and p-anisyl. The technique involved the formation of the Lewis acid-base adduct at room temperature or lower by the addition of trichloroborane to the amine in chlorobenzene followed by dehydrohalogenation at the reflux temperature.

Volatile and non-volatile N-trialkylborazines and N-triarylborazines can be prepared by the reduction of the corresponding chloroborazine (equation 2). The reduction $B_3Cl_3N_3R_3 + 3NaBH_4 \rightarrow B_3H_3N_3R_3 + 3NaCl + \frac{1}{2}B_2H_6$ (2) was found to proceed smoothly in a polyethylene glycol ether solvent. The availability of several of these ethers facilitated the separation of the product from the solvent. The volatile borazines were prepared in the less volatile triethylene glycol dimethylether solvent and the non-volatile borazines were prepared in the more volatile diethylene glycol dimethylether solvent.

A new method for the preparation of B-trisubstituted-borazines has been developed. The synthesis involved the reaction of Grignard reagents with B-trichloroborazine (equation 3). When R is methyl the reaction



was complete at room temperature; however, when R was ethyl or phenyl the compound was obtained only after pyrolysis of the residual solids remaining after the removal of the solvent. This technique was shown to be adaptable to the preparation of hexasubstituted borazines.

The reaction of borazine with methanol yielded an adduct of composition $B_3H_3N_3H_3 \cdot 3CH_3OH$ as reported in the literature; however, pyrolysis of this adduct produced hydrogen, ammonia-methyl borate and methanol as the volatile products. The monomer $BOCH_3NH$ (which has been reported in the literature as the product of this pyrolysis) could not be detected. Furthermore, it was demonstrated that its trimer, $B_3(OCH_3)_3N_3H_3$, is formed in the pyrolysis. Attempts to isolate a borazine-ethanol adduct from the reaction of borazine with ethanol were unsuccessful; partial ethanolysis of the borazine ring occurred.

Several thermal stability studies were undertaken. It is known that borazine at elevated temperatures is stable in the vapor state; it has been demonstrated that rapid decomposition is observed at equivalent temperatures when a liquid phase is present. B-trimethylborazine is thermally stable at its normal boiling point (129.1 degrees) for prolonged periods whereas B-triethylborazine decomposes rapidly above 80 degrees.

Microfilm \$2.50; Xerox \$5.60. 115 pages.

NATURE AND REACTIONS OF THE
COMPLEXES OF NICKEL, PALLADIUM,
AND PLATINUM WITH 2-PYRIDINALDOXIME
AND DIMETHYLGLYOXIME.

(L. C. Card No. Mic 60-761)

Ronald Alfred Krause, Ph.D.
The Ohio State University, 1959

Studies are reported in the dissertation which embody the preparation of nickel(II), palladium(II), and platinum(II) complexes of 2-pyridinaldoxime, their characterization, their reactions with organic reagents containing active halogen, and their reactions with bromine. Included also are studies on the reactions of dimethylglyoxime complexes of the same metals.

2-Pyridinaldoxime (HPOX) forms several different types of compounds with nickel(II) which differ from each other in metal to ligand ratio and in the total number of oxime protons which have been removed from the ligand. These types are exemplified by $[\text{Ni}(\text{HPOX})_3]\text{I}_2$, $[\text{Ni}(\text{HPOX})_2\text{Cl}_2]$, $[\text{Ni}(\text{POX})(\text{HPOX})\text{I}]$, and $[\text{Ni}(\text{POX})_2]$. Several of the compounds which were prepared display properties distinctly different from those observed in previously studied complexes of similar ligands.

The most striking difference was observed in $[\text{Ni}(\text{POX})_2]$. This complex, unlike most nickel oxime complexes of this type, is quite soluble in water. Furthermore, it is strongly paramagnetic, indicating a nonplanar structure. The temperature dependence of the magnetic susceptibility of $[\text{Ni}(\text{POX})_2]$ has been determined and the Weiss constant was found to be unusually large, with a value of 226.3° . The magnetic moment, calculated from this data, is quite high, with a value of 3.56 Bohr Magnetons. $[\text{Ni}(\text{POX})_2]$ could be a polymeric octahedral species (utilizing oxime oxygens as additional donor groups) or it could display the unfavored tetrahedral configuration.

A second unusual complex which has been prepared is $[\text{Ni}(\text{POX})(\text{HPOX})]\text{I}$. This compound is also paramagnetic with an observed magnetic moment of 3.01 Bohr Magnetons. It is proposed that the structure of this compound is similar to that displayed by $[\text{Ni}(\text{POX})_2]$.

Interesting also are the compounds $[\text{Ni}(\text{HPOX})_2(\text{CH}_3\text{CO}_2)_2]$ and $[\text{Ni}(\text{POX})(\text{HPOX})(\text{CH}_3\text{CO}_2)(\text{H}_2\text{O})]$, which show unusual infrared absorption spectra in that the acetate carbonyl peak appears at an unusually high frequency (1760 and 1772 cm^{-1} respectively). The observed high frequency for this vibration suggests the COO-Ni link to be very covalent.

The palladium(II) and platinum(II) compounds which have been prepared in this work consist of $[\text{Pd}(\text{POX})(\text{HPOX})]\text{Cl}$, $[\text{Pd}(\text{POX})_2]$, and $[\text{Pt}(\text{POX})_2]$. These compounds appear to show no unusual features. Their reaction products are discussed below.

In the dissertation are reported the first reactions in which complexes containing an oxime ligand are acylated without complete removal of the oxime ester from the coordination sphere. Acetyl chloride reacts with chloroform solutions of $[\text{Pd}(\text{POX})_2]$ and $[\text{Pt}(\text{POX})_2]$ to precipitate the acylated complexes $[\text{Pd}(\text{POX}-\text{COCH}_3)\text{Cl}_2]$ and $[\text{Pt}(\text{POX}-\text{COCH}_3)_2]\text{Cl}_2$. Reaction with the nickel complex $[\text{Ni}(\text{POX})_2]$ results in decomposition. On hydrolysis the acylated palladium complex forms $[\text{Pd}(\text{POX})\text{Cl}]_2$. The infrared absorption spectra of the acylated complexes contain unusually high carbonyl frequencies, with values of 1790

and 1780 cm^{-1} for the palladium and platinum complexes respectively.

The reaction of $[\text{Pt}(\text{DMG})_2]$ (where HDMG stands for dimethylglyoxime, and DMG stands for its uninegative anion) with acetyl chloride has been studied in an extension of earlier work. The product, $[\text{Pt}(\text{HDMG})\text{Cl}_2]$, is the same as that previously found in the nickel and palladium systems.

In the reaction with bromine, both $[\text{Pd}(\text{POX})_2]$ and $[\text{Pt}(\text{POX})_2]$ form complexes of the type $[\text{M}^{\text{IV}}(\text{POX})_2\text{Br}_2]$. The palladium(IV) complex is less stable than the corresponding platinum(IV) species, and under the appropriate conditions attack on the ligand begins, forming unidentified products.

The reaction of bromine with chloroform solutions of $[\text{Pt}(\text{DMG})_2]$, $[\text{Pd}(\text{DMG})_2]$, and $[\text{Ni}(\text{DMG})_2]$ has also been studied. $[\text{Pt}(\text{DMG})_2]$ is a model for oxidation in this system, the reaction proceeding smoothly to form $[\text{Pt}(\text{DMG})_2\text{Br}_2]$; the palladium complex reacts to yield $[\text{Pd}(\text{HDMG})\text{Br}_2]$, and not the palladium(IV) compound. $[\text{Ni}(\text{DMG})_2]$ on reaction with bromine gives a mixture of $[\text{Ni}(\text{HDMG})\text{Br}_2]$, $[\text{Ni}(\text{HDMG})_2\text{Br}_2]$, and oxidized dimethylglyoxime. The observation that palladium remains in the +2 state lends support to the conclusion that ligand, and not metal, is oxidized in the nickel system.

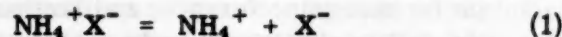
Microfilm \$2.50; Xerox \$7.20. 152 pages.

ACID-BASE EQUILIBRIA IN LIQUID AMMONIA

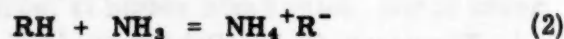
(L. C. Card No. Mic 60-532)

Joseph John Lagowski, Ph.D.
Michigan State University, 1957

The equilibrium which occurs in a liquid ammonia solution of a strong acid, e.g., an ammonium salt, is expressed by equation 1.



When a weak acid is dissolved in liquid ammonia, the following equilibria are established.



Equation 2 represents the ionization of the weak acid, whereas 1 and 3 represent the dissociation of an ion pair to free ions. Equilibria 1, 2, and 3 were investigated voltammetrically and spectrophotometrically.

The voltammetric reduction wave which occurs at a rotating platinum microelectrode in liquid ammonia solutions of acids at -77°C . was found to result from the reduction of ion pairs containing the ammonium ion. Data based on the temperature coefficient of the diffusion current, the power dependence of the rate of rotation of the microelectrode, and the linearity of the plot of the limiting current versus the concentration of ammonium salt indicate that the electrode process is diffusion controlled. The voltammetric method could not be used to estimate the values of ionization or dissociation constants of acids (equations 1, 2, and 3) in liquid ammonia, because the platinum microelectrodes became coated with a dark deposit which changed the electrode characteristics. The

deposit was shown to be finely divided platinum, and a mechanism was proposed for its formation.

Equilibria 1, 2, and 3 were investigated spectrophotometrically using phenolphthalein as an indicator. A method was developed to determine absorption spectra of liquid ammonia solutions at -77°C . Two procedures were devised to determine the ionization and dissociation constants of indicators which behave as monobasic acids. The dissociation constants of several ammonium salts, urazole, and urazine were determined in liquid ammonia solutions. Water, urea, benzamide, acetamide, aniline, and carbonylhydrazide were not sufficiently acidic in liquid ammonia to effect the color of phenolphthalein. The ionization and dissociation constants of guanazole and thiourea were estimated in liquid ammonia solutions.

Microfilm \$2.55; Xerox \$9.00. 196 pages.

NUCLEAR CHARGE DISTRIBUTION IN FISSION:
INDEPENDENT YIELDS OF NIOBIUM ISOTOPES
FROM THERMAL-NEUTRON FISSION
OF ^{233}U , ^{235}U , AND ^{239}Pu .

(L. C. Card No. Mic 59-6945)

David Elliott Troutner, Ph.D.
Washington University, 1959

Chairman: Dr. Arthur C. Wahl

Independent yields of ^{96}Nb and ^{97}Nb from thermal-neutron fission of ^{233}U , ^{235}U , and ^{239}Pu have been measured. Samples of ^{233}U , ^{235}U , and ^{239}Pu were irradiated with thermal neutrons, and then dissolved. The solution was divided into two portions, and zirconium was separated from niobium in the first portion by precipitating BaZrF_6 soon after irradiation. The niobium remaining in solution was purified, and the activities of niobium fission products were measured. Zirconium was separated from niobium in the second portion after ^{97}Nb was in transient equilibrium with ^{97}Zr , niobium was purified, and the activity of ^{97}Nb was measured.

The independent yields of ^{96}Nb and ^{97}Nb relative to the cumulative yield of ^{97}Zr were determined from the measured activities and converted to fractional chain yields by correcting for differences between the cumulative yield of ^{97}Zr and the mass-number-96 and -97 chain yields. The measured independent yields of ^{96}Nb and ^{97}Nb are shown in Table I.

Table I.

Fission process	Fraction of chain yield	
	^{96}Nb	^{97}Nb
$^{233}\text{U}(\text{n},\text{f})$	$(1.3 \pm 0.3) \times 10^{-3}$	$(1.1 \pm 0.7) \times 10^{-2}$
$^{235}\text{U}(\text{n},\text{f})$	$(1.0 \pm 0.2) \times 10^{-4}$	$(1.7 \pm 1.3) \times 10^{-3}$
$^{239}\text{Pu}(\text{n},\text{f})$	$(7.7 \pm 1.0) \times 10^{-4}$	$(1.5 \pm 0.7) \times 10^{-2}$

The ^{94}Nb yields from fission of ^{92}U are much lower than those predicted by the postulate of equal charge dis-

placement, while those from fission of ^{94}Pu are nearly normal. This fact supports the hypothesis that the formation of 50-proton nuclides and their complements is favored at the expense of 51-proton nuclides and their complements.

A niobium isotope with a half-life of 51 ± 3 minutes was discovered among the fission products. This isotope was identified as ^{96}Nb and upper limits were set for its independent fission yields. Upper limits were also set for the independent fission yields of 90-hour $^{95\text{m}}\text{Nb}$. These limits are shown in Table II.

Table II.

Fission process	Fraction of chain yield	
	$^{95\text{m}}\text{Nb}$	^{96}Nb
$^{233}\text{U}(\text{n},\text{f})$	$< 3 \times 10^{-4}$	$< 5.1 \times 10^{-2}$
$^{235}\text{U}(\text{n},\text{f})$	$< 4 \times 10^{-5}$	$< 1.5 \times 10^{-2}$
$^{239}\text{Pu}(\text{n},\text{f})$	$< 3 \times 10^{-4}$	$< 4.3 \times 10^{-2}$

Microfilm \$2.50; Xerox \$3.00. 57 pages.

CHEMISTRY, ORGANIC

STUDIES IN THE
DIPHENYLCYCLOPROPENE SERIES.
DETECTION OF A CYCLOPROPENE ANION.

(L. C. Card No. Mic 59-6994)

Merle A. Battiste, Ph.D.
Columbia University, 1959

The thermal decomposition of ethyl diazomalonate and ethyl diazoacetate in the presence of excess diphenylacetylene produced, after hydrolysis, the two cyclopropene acids 1,2-diphenyl-3,3-dicarboxycyclopropene and 1,2-diphenyl-3-carboxycyclopropene. In the ultraviolet the two acids have identical absorption maxima, and on melting they both rearrange to α,β -diphenylcrotonolactone. The structural evidence presented is consistent only with the cyclopropene formulation.

According to the molecular orbital theory as developed by Hückel, the cyclopropene anion should not possess aromatic stability. In fact, there is reason to believe that it should be unstable in light of its predicted triplet ground state. Appropriate substitution on the cyclopropene ring, however, might be expected to render the anion experimentally detectable, especially since simple LCAO calculations on 1,2-diphenyl-3-carboalkoxycyclopropene anion predict a non-triplet ground state and a gain in delocalization energy of 1.53β over the conjugate acid.

When the ester, 1,2-diphenyl-3-carbo-t-butoxycyclopropene, was subjected to refluxing deuterio-t-butyl alcohol containing potassium t-butoxide as base, 4.7% of one atom of deuterium was found in the recovered ester after a 31-hour equilibration. Equilibration of this same material for a further 26 hours resulted in incorporation of

9.4% of one atom of deuterium. The exchange is quite slow, but is apparently a real deuteration in view of the proportional uptake of deuterium with time. The possibility that the deuterium was in the phenyl rings was excluded by analysis of the benzoic acid obtained on permanganate oxidation of the 9.4% material. Hydrolysis of the 9.4% ester gave the cyclopropene material analyzing for essentially the entire deuterium content.

Although this exchange was most reasonably interpreted as proceeding through a substituted cyclopropene anion, an unlikely alternative sequence was possible, involving addition of *t*-butyl alcohol across the ring double bond, exchange of the resulting cyclopropane and elimination of the alcohol to give back the cyclopropene. To rule out such a sequence 1-methoxy-1,2-diphenyl-3-carbomethoxycyclopropane was synthesized and subjected to the previous equilibrating conditions for 67 hours. As no cyclopropene was formed during this period, it is very unlikely that alkoxycyclopropanes could be reactive intermediates in the observed deuterations.

In an attempt to obtain further information on the stability of the cyclopropenyl anion Δ^1 -1,2-diphenyl-3-carbomethoxycyclopropene was equilibrated with a tenfold excess of potassium triphenylmethide in ether and the resulting solution decomposed with deuterium oxide. The major product obtained from this equilibration was a material whose properties were consistent only with the adduct of triphenylmethane across the ring double bond. However, a small amount of the original cyclopropene was recovered undeuterated, revealing that the cyclopropene ester is less acidic than triphenylmethane.

When Δ^2 -1-benzoyl-1,2-diphenylcyclopropene, prepared by the action of diphenylcadmium on Δ^1 -1,2-diphenylcyclopropene-3-carboxylic acid chloride, was refluxed for 15 hours with potassium *t*-butoxide in deuterio *t*-butyl alcohol, essentially 100% equilibration of the α -methylenic hydrogen occurred as shown by deuterium analysis and nuclear magnetic resonance spectroscopy. One concludes from this that exchange in the cyclopropene ester and ketone must proceed through the appropriate cyclopropene anion and that the slowness in exchange of the ester compared to ketone is a reflection only of the relative activating strengths of the carboalkoxy group and the benzoyl group. The rather weak acidity of the α -hydrogen in the ester may perhaps be a result of a destabilizing interaction of the ring double bond with the anion electron pair; however, it is not possible at the moment to distinguish this from the simple steric retardation of placing a third trigonal atom in the cyclopropene ring. Whatever the explanation, it is certainly clear that the cyclopropene anion is not aromatic.

Treatment of Δ^1 -1,2-diphenyl-3-carbomethoxycyclopropene with phenylmagnesium bromide gave the expected alcohol, diphenyl-(Δ^1 -1,2-diphenylcyclopropenyl)-carbinol. Various attempts were made to dehydrate this carbinol to tetraphenylmethylenecyclopropene; however, the only two hydrocarbon products isolated had undergone extreme carbon skeleton rearrangement. The predominant material obtained was 1,2,4-triphenyl-naphthalene, while trace amounts up to 3% of 1,2,3-triphenylazulene were also formed. Although these products are rather surprising, a mechanism is proposed to account for their formation. Microfilm \$2.50; Xerox \$5.00. 96 pages.

REACTIVITIES OF ALIPHATIC FLUORIDES

(L. C. Card No. Mic 60-723)

Leonard Henry Beck, Ph.D.
The Ohio State University, 1959

The directive effect of fluorine in the photochlorination of aliphatic fluorides has revealed a preference for reaction beta to the fluorine cluster. For example, $\text{CF}_3\text{-CH}_2\text{-CH}_3$ preferentially forms $\text{CF}_3\text{-CH}_2\text{-CH}_2\text{Cl}$. The alpha hydrogens are presumed acidic in nature because of the inductive effect of the adjacent fluorine atoms, and hence less susceptible to the even split required by free radical reaction.

The purpose of this research was to determine the character of a hydrogen atom attached, not adjacent to, but directly on the carbon atom bearing the fluorine atoms.

Surprisingly the hydrogen of fluoroform, H-CF_3 , reacts under conditions free radical in character and shows no resemblance to the protonic hydrogen of chloroform, H-CCl_3 . The attempt was thus to contrast and compare the reactivity of compounds of the type $\text{R}_f\text{CF}_2\text{H}$ and R_fCFH_2 .

Reactions of these compounds attempting to remove H^+ were entirely unsuccessful. However, reactions essentially free radical in character such as photochlorination and thermal chlorination, bromination and oxidation were quite successful with both the $\text{R}_f\text{CF}_2\text{H}$ and R_fCFH_2 functional groups.

For further contrast the compound $\text{HCF}_2\text{-CF}_2\text{-CFH}_2$ was prepared to provide isomeric monohalide ratios, namely, $\text{XCF}_2\text{-CF}_2\text{-CFH}_2$ and $\text{HCF}_2\text{-CF}_2\text{-CFXH}$. The isomer ratios were so nearly 1:1 that a more sensitive method was required to obtain a clearer distinction between the two functional groups.

A photographer's electronic flash rated at 50 watt-seconds with a flash duration of 1/800 second provided sufficient energy to initiate reaction on compounds of the type $\text{CF}_3\text{-CF}_2\text{H}$, $\text{HCF}_2\text{-CF}_2\text{H}$, $\text{HCF}_2(\text{CF}_2)_n\text{CF}_2\text{H}$ and $\text{CH}_3\text{-CF}_2\text{H}$, to chlorinate the group $\text{-CF}_2\text{H}$ to $\text{-CF}_2\text{Cl}$. Under identical conditions the -CFH_2 group was not appreciably affected.

The conclusion was drawn that the hydrogen in both the $\text{-CF}_2\text{H}$ group and the -CFH_2 group is subject to even splitting and will react under conditions essentially free radical in character. Further, it appeared that the $\text{-CF}_2\cdot$ free radical is more stable than the $\text{-CFH}\cdot$ free radical.

Nuclear magnetic resonance spectroscopy has been employed on an extensive series of aliphatic fluorides in an attempt to show a correlation between proton shielding data and susceptibility to free radical halogenation.

Compounds of the type $\text{R}_f\text{CF}_2\text{H}$ were prepared by decarboxylating the sodium salt of the corresponding acid in ethylene glycol. The compounds of the type R_fCFH_2 were prepared by making the paratoluenesulfonate ester of the corresponding alcohol, $\text{R}_f\text{CH}_2\text{OH}$. The tosylate group was then replaced with fluorine, employing potassium fluoride in dimethyl sulfoxide solvent.

Photochlorination was performed in a quartz tube by using an Hanovia mercury arc sun lamp, and thermal chlorination, bromination and oxidation were accomplished in an electrically heated Pyrex tube.

Thermal oxidation gave new inert products only with compounds of the type $\text{HCF}_2(\text{CF}_2)_n\text{CFH}_2$, where $n = 1$ and 3. The single product from $\text{HCF}_2\text{-CF}_2\text{-CFH}_2$ was

tentatively identified as $\text{CF}_2\text{-CF}_2\text{-CFH-O}$. Compounds of the type $\text{CF}_3(\text{CF}_2)_n\text{CF}_2\text{H}$, $\text{CF}_3(\text{CF}_2)_n\text{CFH}_2$ and $\text{HCF}_2(\text{CF}_2)_n\text{CF}_2\text{H}$ led only to complete decomposition in the same temperature range, namely, 300°-600°C.

The boiling and melting points, infrared spectra and nuclear magnetic resonance spectra of a number of aliphatic fluorides were also accomplished.

Microfilm \$2.50; Xerox \$3.00. 56 pages.

THE SYNTHESIS AND REACTIONS OF
DERIVATIVES OF BIS-ACETYLFERROCENE.
OTHER FERROCENE DERIVATIVES.

(L. C. Card No. Mic 60-399)

Charles Eugene Cain, Ph.D.
Duke University, 1959

Supervisor: Charles R. Hauser

A study of the reactions of derivatives of ferrocene was undertaken to better establish the chemical properties of this new organometallic nucleus. This study was involved primarily with the acylations and condensations of the symmetrical molecule, bis-acetylferrocene. Also included were the reactions of some mono-substituted ferrocene derivatives, ferrocenylacetonitrile and hydroxymethyl- and formylferrocene.

The acylation of bis-acetylferrocene was carried out using alkali amide and the appropriate ester to produce bis-acetyl-, propionyl-, and benzoyl- β -diketones. Only bis-acylation was observed in every case regardless of the proportions of reagents employed. No mono-acetylation or benzoylation product was isolated even when only one mole of ester was added for each mole of dianion.

The benzoylation of bis-acetylferrocene was carried out using alkali amide and methyl benzoate to produce the bis-benzoyl- β -diketone in varying yields according to the ratio of reactants employed. The best yield (62%) was obtained using 4 equivalents of ester and amide for each equivalent of diketone.

Two derivatives of the bis-benzoyl- β -diketone were prepared. The bis-pyrazole was produced by cyclization of the bis- β -diketone with two equivalents of hydrazine. An internal copper chelate evidently containing one copper atom complexed with one molecule of the bis- β -diketone was also prepared.

The infra-red absorption spectra of the bis-benzoyl- β -diketone was compared with that of its phenyl analog, dibenzoylmethane and with those of the two derivatives.

The acetylation and propionylation of bis-acetylferrocene, like the benzoylation, produced only the bis- β -diketone when carried out with alkali amide and the appropriate ester. The bis-acetyl- β -diketone was produced in 72% yield and the bis-propionyl- β -diketone in 50% yield.

Both the bis-acetyl and the bis-propionyl- β -diketone were cyclized using excess hydrazine to produce the corresponding bis-pyrazoles.

Further acylation of the bis-acetyl- β -diketone using excess potassium amide and methyl benzoate produced only the mono-benzoyl- β , δ -triketone. None of the bis-

benzoyl- β , δ -triketone was isolated in spite of the large excess of reagents (6:1 amide, 8:1 ester) employed.

The infra-red absorption spectra of bis-acetyl- and bis-propionyl- β -diketones and the mono-benzoyl-triketone were compared with the spectra of the bis-benzoyl- β -diketone and other related compounds. The spectra of the two new bis-pyrazoles were compared with that of the bis-benzoyl pyrazole.

The conditions for effecting an aldol condensation, accompanied by the elimination of water, between bis-acetylferrocene and benzaldehyde, produced two different derivatives.

One was the expected bis-benzal derivative produced by the condensation of two molecules of benzaldehyde with one mole of bis-acetylferrocene. This bis- α , β -unsaturated ketone was identified by its infra-red spectrum and by reduction to the corresponding saturated ketone by means of potassium in liquid ammonia.

The other derivative was evidently a cyclic ketone produced by the condensation of one mole of ketone produced by the condensation of one mole of bis-acetylferrocene with one mole of benzaldehyde. Evidence for this cyclic product included the infra-red spectrum and the reactions indicating the presence of only one ketone group. Reaction of an excess of methyl Grignard reagent with the cyclic derivative produced a carbanol analyzing for only one active hydrogen and reaction with an excess of 2,4-dinitrophenylhydrazine produced only the mono-2,4-dinitrophenylhydrazone.

The cyclic derivative may have been produced by an intra-molecular conjugate addition involving the side-chains on the two cyclopentadienyl rings. That this reaction competes with the condensation of the unreacted ketone group with benzaldehyde is indicated by the inverse relationship between the yield of the cyclic product and the concentration of benzaldehyde employed.

Confirmation of the structure of ferrocenylacetonitrile was provided by a study of its infra-red spectra and by reaction of the two active α -hydrogens of the molecule with benzaldehyde in an aldol type condensation accompanied by the elimination of water. The infra-red spectrum of the condensation product, the α , β -unsaturated nitrile, indicated the presence of conjugated nitrile and carbon-carbon double bond groupings, as well as the presence of mono-substituted ferrocene and benzene rings.

Ferrocene dibenzyl type ether was prepared from hydroxymethyl ferrocene by treatment with an ethanol-water solution containing dilute potassium permanganate or a catalytic amount of acetic acid. This symmetrical ether was the only product isolated from an attempted oxidation of hydroxymethylferrocene to the ferrocene acetic acid using potassium permanganate. Attempts to prepare the acid from the corresponding ferrocene and aldehyde failed, with the alcohol and aldehyde groups, as well as the iron in the ferrocene nucleus, showing unusual resistance to oxidation by permanganate.

Microfilm \$2.50; Xerox \$4.60. 88 pages.

PART I. DEHYDROCYCLIZATION OF
 n -HEPTANE-1- C^{14} OVER
 CHROMIA-ALUMINA CATALYSTS.
 PART II. DEHYDROCYCLIZATION OF
 n -OCTANE-1- C^{14} OVER
 CHROMIA-ALUMINA CATALYSTS.
 PART III. THERMAL REACTIONS OF
 5-ETHYL- AND OF 4,5- AND
 5,6-DIMETHYL-1,3-CYCLOHEXADIENES.

(L. C. Card No. Mic 60-424)

Chao-Tung Chen, Ph.D.
 Northwestern University, 1959

Adviser: Herman Pines

Part I deals with the mechanism of the reaction mentioned in the title. The mechanisms existing in the literature would predict 50 % methyl labeled toluene from n -heptane-1- C^{14} . It was reported that n -heptane-1- C^{14} gave 27-29 % methyl labeled toluene, and three mechanisms were postulated to account for the results. In none of the published papers dealing with aromatization reactions catalyzed by chromia-alumina was there any reference made that alumina may exert an effect on the composition of aromatics produced. Four catalysts were used in this study: 1. chromia alone; 2. chromia-alumina in which the alumina was prepared by hydrolysis of aluminum isopropoxide and is considered to have intrinsic acidic properties; 3. catalyst 2 impregnated with potassium and cerium nitrates; 4. chromia-alumina in which the alumina was prepared from potassium aluminate and is considered to have very weak intrinsic acidic properties. We found that C^{14} distribution changes during dehydrocyclization experiments of n -heptane-1- C^{14} depending upon the type of catalysts. The data were interpreted on the basis of mechanisms involving five-, six-, and seven-membered ring intermediates, the relative contributions of which depend upon the nature of catalysts and change with time. It was proposed that an adsorbed cycloheptane species is formed by a 1,7-ring closure which rolls around rapidly before undergoing a ring contraction and aromatization. The seven carbon atoms acquire isotope equivalency resulting in a 14.3 % methyl label.

The mechanism of earlier workers would predict the following side chain activities for the aromatics obtained from n -octane-1- C^{14} : *o*-xylene, 100 %; *m*- and *p*-xylenes and ethylbenzene, 50 %.

Part II shows that the prediction was not realized and that the distribution of aromatics and that of C^{14} also depend on the type of catalyst used and change with time. The C^{14} distribution data and evaluation of data obtained from aromatization of 1-methyl-2-ethylcyclopentane, methylcycloheptane, and cyclooctane over chromia-alumina catalysts lead us to conclude as follows. The dehydrocyclization of n -octane involves five-, six-, seven-, and eight-membered ring intermediates, the relative contributions of which depend on the nature of chromia-alumina catalysts and change with time. Participation of a carbonium ion mechanism to a small extent is possible in reactions over chromia alone or catalyst 2, as evidenced by isomerization accompanying aromatization of eight-carbon six-membered ring hydrocarbons. Catalysts 3 and 4 do not cause such isomerization. Thus, acidities of catalysts affect product distribution in aromatization

reactions, but the arrangement of chromia on alumina may be more important in directing specific ring closures of open chain hydrocarbons.

Part III shows that the thermal reactions of the dienes mentioned in the title gave mixtures of ethyl-, 1,2-dimethyl-, and 1,4-dimethyl-cyclohexadienes according to the bialllyl biradical mechanism proposed previously. 1,3-Dimethyl-cyclohexadienes were not formed as the mechanism predicted.

Microfilm \$2.50; Xerox \$8.60. 186 pages.

SOLUBILITY STUDIES OF SOME
 METHYL ESTERS OF SATURATED AND
 UNSATURATED FATTY ACIDS IN ACETONE
 OVER THE TEMPERATURE RANGE 0 TO -70°C.

(L. C. Card No. Mic 60-642)

Don Pearson Claypool, Ph.D.
 University of Kentucky, 1952

Since an analytical separation of the methyl esters of the saturated fatty acids has been demonstrated to be possible,¹ it was considered advisable to investigate the possibility of separating the methyl esters of saturated and unsaturated fatty acids by fractional crystallization from acetone at low temperatures. The purpose of this work was to determine the solubilities of some of these esters in acetone in the temperature range -10 to -70 degrees.

The solubility in acetone was determined for methyl caprate, methyl laurate, methyl meristate, methyl palmitate, methyl oleate, and methyl linoleate in the temperature range -10 to -70 degrees. The solubility of methyl stearate in acetone was also determined in the temperature range 20 to 2 degrees. Individual determinations did not deviate from the average more than plus or minus two and one-half percent. For lower solubilities the accuracy of the method decreased but the order of magnitude of the solubility in this range established. Factors that may cause errors in these solubility determinations are discussed.

A thermostat is described which maintained temperatures within plus or minus one-tenth of a degree in the temperature range -10 to -50°, and with no observable temperature variation at -60 and -70° or in the range 20 to 2 degrees. A solubility cell was designed which permitted easy sampling of the saturated solution without altering the solution. Purification by fractional crystallization of the solutes in the cell was also possible. A procedure is described for the determination of the solubility of methyl esters of the unsaturated fatty acids while they are kept in an atmosphere of dry nitrogen.

After most of this work had been completed, Sedgewick, Hoerr, and Harwood² published data on the solubility of methyl esters of the saturated fatty acids in acetone which partially duplicated this work, but expressed their results only to 0.1 g. of solute per 100 g. of solvent. Their results were lower than those obtained when the data described in this thesis was plotted as the logarithm of the mole fraction versus the reciprocal of the absolute temperature indicates that the heats of solution of the saturated methyl esters do not differ greatly from their

heats of fusion and that there are regular differences between the heats of solution of adjacent members of this homologous series. This is not true when the data of Sedgewick, Hoerr, and Harwood is used. Due to this fact, the data obtained in this work appear to be more reliable in the lower ranges of solubility and can be expressed to one more significant figure.

The curves obtained for methyl oleate and methyl linoleate, when their solubilities expressed as the logarithm of the mole fraction were plotted versus the reciprocal of the absolute temperature, were concave upward. This indicates that the portion of the actual solubility curve under consideration was undergoing the sigmoidal transition toward the ideal. Since no heats of fusion were available for these two esters, the above curves could not be compared with the ideal solubility curves.

The saturated methyl esters with the exception of methyl caprate had very low solubilities at temperatures below -50° while methyl linoleate and methyl oleate were appreciably soluble at -40 and -50 degrees. From these data it appears that -40° is the optimum temperature for the separation of methyl oleate and methyl palmitate from the unsaturated methyl esters by fractional crystallization.

Microfilm \$2.50; Xerox \$4.60. 88 pages.

1. Wyman and Barkenbus, Ind. Eng. Chem., Anal. Ed., 12, 658 (1940).
2. Sedgewick, Hoerr, and Harwood, J. Org. Chem., 17, 327 (1952).

THE ALKALINE DEGRADATION OF ADENOSINE TRIPHOSPHATE

(L. C. Card No. Mic 59-6938)

William Henry Cook, Ph.D.
Washington University, 1959

Chairman: Professor David Lipkin

Re-examination of the hydrolysis of adenosine-5'-triphosphoric acid (ATP) in aqueous barium hydroxide solution has shown that, in addition to the previously reported products of this reaction, at least five adenine mononucleotides are formed in significant amounts. These five "new" products were identified as adenosine-2'- and 3'-phosphoric acids, the 2', 5'- and 3', 5'-diphosphoryl-adenosines, and adenosine-3':5'-phosphoric acid (A-3':5'-P). The latter compound had never been reported in the literature. Its structure was proven conclusively by the methods of classical organic chemistry as well as by enzymatic methods.

The carbon, hydrogen, nitrogen, and phosphorus analyses, the phosphorus:adenine ratio, and the molecular weight of A-3':5'-P were in good agreement with the calculated values, and its ultraviolet absorption spectrum was typical of adenylic acids. By polarimetric comparison with appropriate compounds, its anomeric carbon atom was found to have the beta configuration. Ribose was the only aldopentose formed when A-3':5'-P was degraded by liquid, anhydrous hydrogen fluoride, while treatment with *Crotalus adamanteus* venom yielded a mixture of adenosine and adenosine-3'-phosphoric acid.

The paper chromatographic and electrophoretic behaviors, the acid-base titration curve, and the results of treatment with prostate phosphomonoesterase all indicated that A-3':5'-P is a diester of orthophosphoric acid. Hydrolysis in barium hydroxide solution gave a mixture of adenosine-3'- and 5'-phosphoric acids, and exhaustive methylation followed by degradation in hydrogen fluoride solution yielded 2-O-methylribose as the only methylpentose found in the reaction mixture. Inosine-3':5'-phosphoric acid resulted from treatment of A-3':5'-P with nitrous acid, showing that the phosphate group is not bound to the 6-amino group. Furthermore, A-3':5'-P was prepared by means of dehydration of adenosine-5'-phosphoric acid by dicyclohexylcarbodiimide (DCC).

The formation of the five "new" products, with the possible exception of adenosine-2'-phosphoric acid, is explained adequately on the basis of intramolecular phosphorylation reactions of ATP. These reactions, as postulated, involve nucleophilic attack of the 3' oxygen atom of ATP on one of the phosphorus atoms with simultaneous cleavage of a phosphorus-oxygen bond. Depending on which phosphorus atom is attacked and which phosphorus-oxygen bond is broken, A-3':5'-P or several relatively unstable intermediate products are formed.

Two of these proposed intermediates, adenosine-3':5'-pyrophosphoric acid and 5'-phosphoryl-adenosine-2':3'-phosphoric acid, were synthesized from a mixture of 2',5'- and 3',5'-diphosphoryl-adenosines by treatment of the latter with DCC, and were found to have the hydrolytic properties required of them as intermediates in the barium hydroxide degradation of ATP.

Other features of the reaction of DCC with the diphosphoryl-adenosines are of interest. Adenosine-3':5'-pyrophosphoric acid evidently is the first compound having an eight-membered cyclic pyrophosphate group to be reported. Another interesting product of this reaction is the dinucleotide P^1, P^2 -bis [(2':3'-phosphoryl)adenosine-5'-] - pyrophosphoric acid, formed by condensation of two molecules of 5'-phosphoryl-adenosine-2':3'-phosphoric acid.

Microfilm \$2.50; Xerox \$7.80. 168 pages.

SOME ORGANOMETALLIC REACTIONS WITH HETEROCYCLIC COMPOUNDS

(L. C. Card No. Mic 60-570)

Justin Ward Diehl, Ph.D.
Iowa State University of Science and Technology, 1959

Supervisor: Henry Gilman

The chemistry of thiaxanthene and related compounds has been reviewed with emphasis placed on the nuclear substituted derivatives. Cyclization of either *o*-mercaptobenzoic acid or 2,2'-dithiodibenzoic acid with monosubstituted benzene derivatives afforded 10-thiaxanthene compounds in which the position of the substituent was not known. The position of this nuclear substituent in several 10-thiaxanthene derivatives has now been established employing two different routes. A mechanism incorporating an intermediate sulfenium ion accounts for the products obtained in this acidic condensation of *o*-mercaptobenzoic acid with benzene and its congeners.

Unique but mechanistically explainable products were found in the reductive halogenation of thiaxanthene-5-oxide with hydrobromic acid. Reaction of thiaxanthene-5-oxide with aqueous hydrobromic acid gave equimolar quantities of 10-thiaxanthene and thiaxanthene. It was postulated that a probable intermediate was 10-bromothiaxanthene which could hydrolyze under the conditions of the experiment to give 10-thiaxanthanol. Disproportionation of this carbinol would yield the observed products.

The reaction of the triphenylsilyllithium with halogenated heterocycles was studied employing different heterocycles and varying the halogen, solvent, and time of reaction. The results of this work indicated that the reaction of triphenylsilyllithium with Ar-X compounds varies appreciably with the nature of the halogen and the solvent. Compounds containing bromine gave a higher yield of hexaphenyldisilane via a halogen-metal interconversion reaction than did compounds containing chlorine. A mixture of tetrahydrofuran and ether as the solvent gave the highest yield of the primary coupling product. A brief historical review of the reactions of organosilylmetallic reagents with organic halides has also been presented.

A particular heterocycle, 10-ethylphenothiazine, was chosen and the triphenylsilyl group was placed in several positions. 2-Triphenylsilyl-, 3-triphenylsilyl- and 4-triphenylsilyl-10-ethylphenothiazine were prepared by the reaction of triphenylsilyllithium with the appropriate halogenated 10-ethylphenothiazine derivative. 10-(2-Triphenylsilylethyl)phenothiazine was prepared in an analogous manner. Several other new derivatives of 10-ethylphenothiazine were also synthesized.

The possibility of synthesizing cyclic-silicon compounds was investigated and in the course of one experiment a carbonyl group was reduced to the methylene group by diphenylsilane. For example, 10-thiaxanthene and 9-fluorenone were reduced to thiaxanthene and fluorene in yields of 63% and 60%, respectively.

Equimolar quantities of benzophenone and diphenylsilane were heated, in the absence of any catalyst or activating agent, at reflux for several hours. Work-up gave diphenylmethane and resinous mixtures of cyclosiloxanes. A possible intermediate in this reduction route was established as benzhydrioxodiphenylsilane. This latter compound when heated to reflux gave a good yield of diphenylmethane. This novel high-temperature reduction of carbonyl groups employing diphenylsilane as the reducing agent was studied. A survey of the use of Si-H compounds as selective reagents for hydrogenations and hydrogenolyses has been made.

Microfilm \$2.50; Xerox \$6.40. 131 pages.

KINETICS OF BASIC HYDROLYSIS OF A HOMOLOGOUS SERIES OF SUBSTITUTED LACTONES

(L. C. Card No. Mic 60-731)

Thomas John Dougherty, Ph.D.
The Ohio State University, 1959

It is the purpose of this research to study the effects of ring size and alkyl substituents on the rates of hydrolysis of small-ring lactones. An investigation of the kinetics

of saponification by hydroxide ion has thus been made for a homologous series of mono-methyl and gem-dimethyl substituted lactones (4 through 7 ring atoms) in 1,2-dimethoxyethane-water (1:1 by volume at 25°). The parent lactones have also been included. The kinetic parameters of the lactones of this study are listed in the following order: average rate constant at temperature specified in l./m. x min., enthalpy of activation (ΔH^\ddagger) in kcal./mole entropy of activation (ΔS^\ddagger) in e.u. and free energy of activation at 25° (ΔF^\ddagger) in kcal./mole: 3-hydroxypropanoic acid lactone, 20.1 (-0.05°), 67.2 (16.1°), 119 (25°), 11.0, -20.6, 17.2; 3-hydroxy-2-methylpropanoic acid lactone, 19.8 (-0.05°), 62.5 (16.1°), 113 (25.0°), 10.8, -21.0, 17.3; 3-hydroxybutanoic acid lactone, 4.85 (-0.05°), 19.8 (16.1°), 35.1 (25.0°), 12.2, -18.6, 17.8; 3-hydroxy-2,2-dimethylpropanoic acid lactone, 2.72 (-0.05°), 7.39 (14.0°), 16.1 (25.0°), 11.0, -24.2, 18.2; 3-hydroxy-3-methylbutanoic acid lactone, 1.09 (-0.05°), 3.38 (14.0°), 7.76 (25.0°), 11.8, -23.1, 18.7; 4-hydroxybutanoic acid lactone, 10.07 (-0.05°), 31.7 (16.1°), 59.2 (25.0°), 11.0, -27.7, 17.5; 4-hydroxy-2-methylbutanoic acid lactone, 5.26 (-0.05°), 16.3 (16.1°), 30.3 (25.0°), 10.8, -23.6, 17.8; 4-hydroxypentanoic acid lactone, 3.84 (-0.05°), 12.9 (16.1°), 22.9 (25.0°), 11.1, -23.2, 18.0; 4-hydroxy-2,2-dimethylbutanoic acid lactone, 1.27 (-0.05°), 3.70 (14.0°), 7.76 (25.0°), 11.0, -25.7, 18.7; 4-hydroxy-3,3-dimethylbutanoic acid lactone, 1.22 (-0.05°), 3.78 (14.0°), 8.24 (25.0°), 11.7, -23.2, 18.6; 4-hydroxy-4-methylpentanoic acid lactone, 1.28 (-0.05°), 4.18 (14.0°), 7.09 (25.0°), 10.4, -27.8, 18.7; 5-hydroxypentanoic acid lactone, 354 (-0.05°), 867 (16.1°), 1401 (25.0°), 8.2, -24.8, 15.6; 5-hydroxy-2-methylpentanoic acid lactone, 156 (-0.05°), 369 (16.1°), 524 (25.0°), 7.3, -29.7, 16.2; 5-hydroxyhexanoic acid lactone, 180 (-0.05°), 436 (16.1°), 661 (25.0°), 8.0, -27.0, 16.1; 5-hydroxy-2,2-dimethylpentanoic acid lactone, 81.2 (-0.05°), 171 (14.0°), 274 (25.0°), 7.3, -31.0, 16.3; 5-hydroxy-3,3-dimethylpentanoic acid lactone, 2.88 (-0.05°), 8.73 (16.1°), 15.5 (25.0°), 10.3, -26.7, 18.3; 5-hydroxy-5-methylhexanoic acid lactone, 0.858 (-0.05°), 2.51 (14.0°), 4.91 (25.0°), 10.9, -26.8, 18.9; 6-hydroxyhexanoic acid lactone, 13.2 (-0.05°), 31.3 (14.0°), 31.3 (25.0°), 9.1, -28.0, 17.5; 6-hydroxyheptanoic acid lactone, 5.14 (-0.05°), 12.1 (14.0°), 22.1 (25.0°), 8.7, -31.4, 18.1.

These data have been interpreted largely on the basis of steric factors and inductive effects involved in the changes in conformations of the various lactones in their conversions to rate-controlling transition states. Possible stabilization of 4-membered lactones by delocalization has been discussed. Microfilm \$2.85; Xerox \$9.90. 218 pages.

THE SYNTHESIS OF SUBSTITUTED THIOPHENETHIOLS AND SOME ω -(N,N-DIALKYLAMINOALKYL)THIENYL SULFIDE HYDROCHLORIDE DERIVATIVES.

(L. C. Card No. Mic 59-5594)

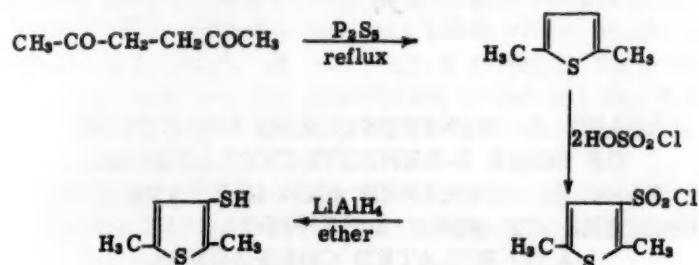
Robert James Fawcett, Ph.D.
Michigan State University, 1957

Major Professor: Robert D. Schuetz

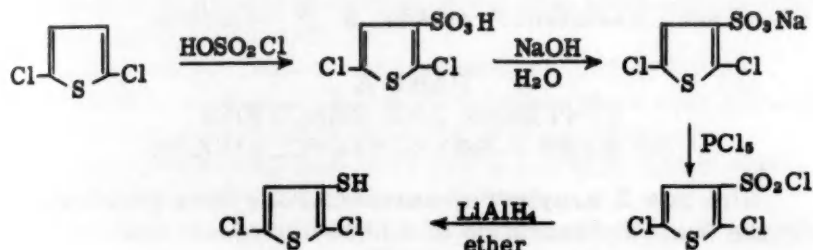
The present investigation was initiated with two main objectives; namely, the study of methods for synthesizing

new substituted thiophenethiols and the preparation of ω -(N,N-dialkylaminoalkyl)thienyl sulfide hydrochloride derivatives from such thiophenethiols. The first aim is of general interest because of the chemistry involved and the other is of pharmacological interest as a possible discovery of new local anesthetics in the latter type of materials.

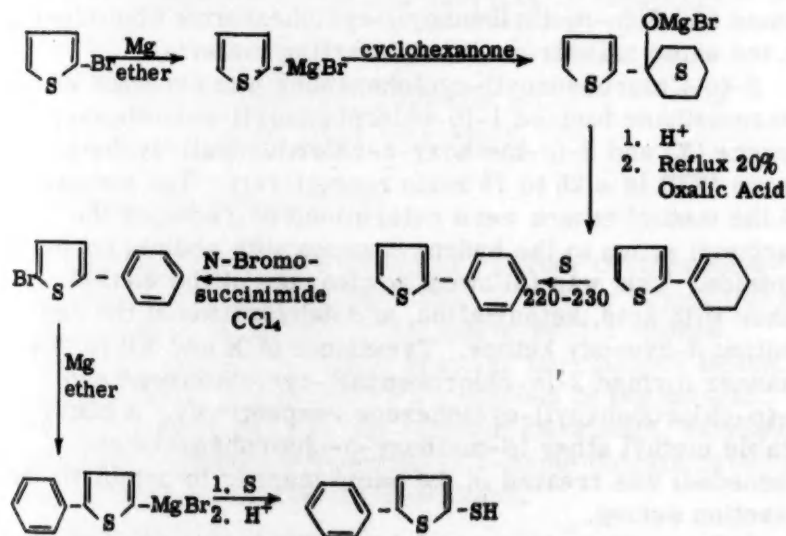
Three substituted thiophenethiols were synthesized which have never been reported previously. The first was 2,5-dimethyl-3-thiophenethiol and its method of preparation is represented by the following equations.



The second new substituted thiophenethiol prepared was 2,5-dichloro-3-thiophenethiol, and it was obtained by the following sequence of reactions.

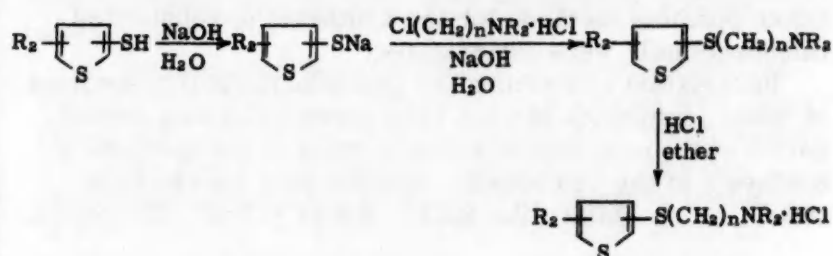


The third thiophenethiol synthesized for the first time was 5-phenyl-2-thiophenethiol. The following sequence of reactions show the method by which it was secured.

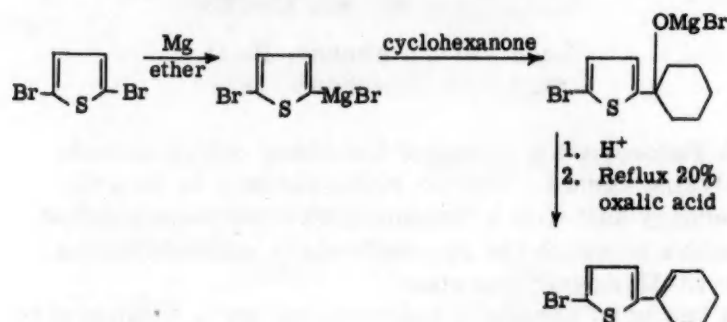


The infra-red spectra of the substituted thiophenethiols were determined and recorded.

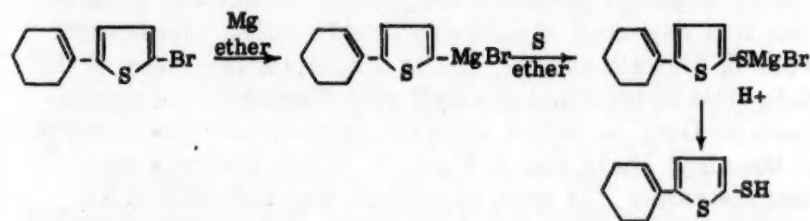
Nine ω -(N,N-dialkylamino) alkyl-2,5-dimethyl-3-thienyl sulfide hydrochlorides, six ω -(N,N-dialkylamino) alkyl-2,5-dichloro-3-thienyl sulfide hydrochlorides and two ω -(N,N-dialkylamino) alkyl-5-phenyl-2-thienyl sulfide hydrochlorides were synthesized for the first time by the following general scheme of reactions.



The compound, 5-bromo-2-(1'-cyclohexenyl) thiophene was synthesized for the first time by the following sequence of reactions, which is a much superior method than any previously reported in the literature.

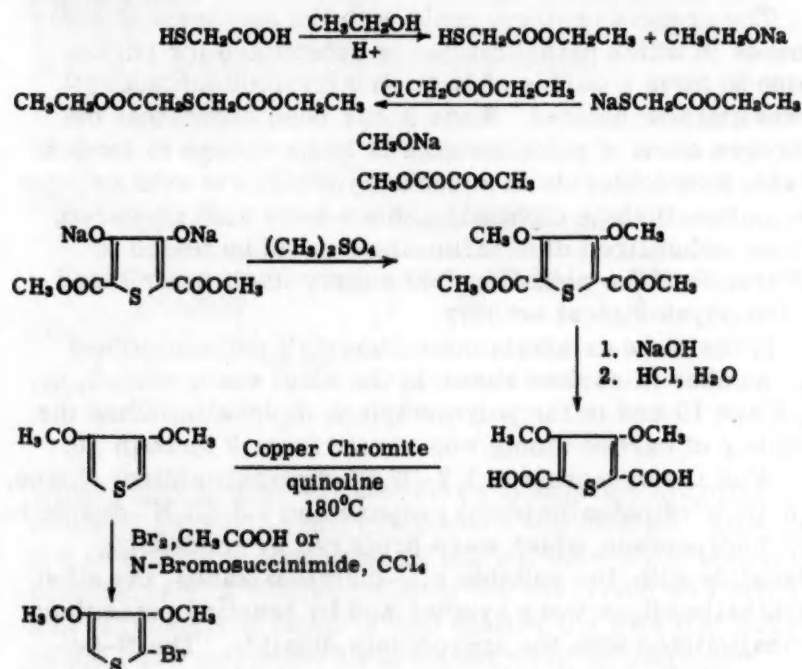


The synthesis of 5-(1'-cyclohexenyl)-2-thiophenethiol was attempted by the following sequence of reactions.



The infra-red spectra of what has been reasonably well established to be 5-(1'-cyclohexenyl)-2-thiophenethiol was determined despite the fact that all attempts to prepare a solid derivative of this compound failed.

The compound 3,4-dimethoxy-2-bromothiophene was prepared for the first time by the following sequence of reactions and some of its physical properties were determined.



Other possible methods for the synthesis of substituted thiophenethiols were investigated.

Information concerning the pharmacological properties of these compounds has not been given since this investigation was concerned only with a study of the methods of synthesis of the compounds reported here for the first time. Microfilm \$3.25; Xerox \$11.50. 251 pages.

SYNTHESIS OF MONOQUATERNARY N-SUBSTITUTED PHTHALIMIDINES

(L. C. Card No. Mic 60-333)

Leon Vernon Fennoy, Ph.D.
St. Louis University, 1959

d-Tubocurarine is one of the oldest known muscle paralyzing agents. King in 1948 proved it to be a diquaternary salt with a bisbenzyltetrahydroisoquinoline structure in which the two quaternary nitrogen atoms were 13-15 Angstroms apart.

It has been generally believed that for a compound to have high muscle paralyzing activity, it must contain at least two quaternary nitrogen atoms spaced as in d-tubocurarine. Kimura, however, found that some monoquaternaryalkyl phthalimides possessed activity greater than that expected of monoquaternary salts. Subsequent work of Siewald showed that in a homologous series of the N-(ω -trialkylammoniumalkyl) phthalimide halides maximum activity occurred when the number of carbon atoms in the alkyl chain was 7, 8 and 9. Other workers have demonstrated: (1) when saccharin was substituted for phthalimide the activity of the series increased slightly; (2) the substitution of succinimide for phthalimide reduced the activity of the series somewhat; (3) when naphthalimide replaced phthalimide the activity of the series was reversed i.e. maximum activity occurred when the number of carbon atoms in the alkyl chain was 4 and 6 and minimum activity when the number of carbon atoms was 8 and 10. This reversal in activity has not as yet been satisfactorily explained.

The present problem deals with the synthesis of compounds in which phthalimidine is substituted for phthalimide to form a series of N-(ω -trialkylammoniumalkyl) phthalimidine halides. Since it has been shown that the nitrogen atom of phthalimidine is basic enough to form a stable hydrochloride in aqueous hydrochloric acid solution the polymethylene diphthalimidines were also prepared. These solubilized diphthalimidines could be tested to determine if the phthalimidine moiety itself contributed to the physiological activity.

In the N-(ω -trialkylammoniumalkyl) phthalimidines the number of carbon atoms in the alkyl chain were 2, 4, 6, 8 and 10 and in the polymethylene diphthalimidines the number of carbon atoms was varied from 2 through 10.

With the exception of 1,2-(N,N'-diphthalimidino) ethane, 1,3-(N,N'-diphthalimidino) propane and 1,5-(N,N'-diphthalimidino) pentane, which were prepared by condensing phthalide with the suitable α,ω -diaminoalkanes, the other diphthalimidines were synthesized by reacting potassium phthalimidine with the appropriate dihalide. The N-(ω -bromoalkyl) phthalimidines were prepared by condensing potassium phthalimidine with the required excess dihalide,

except N-(2-bromoethyl) phthalimidine which was obtained by the bromination of the hydroxy derivative with phosphorus tribromide. The quaternary derivatives were prepared by reacting the N-(ω -bromoalkyl) phthalimidines with the appropriate amine.

Seven new intermediates, fifteen new quaternary salts and eight new polymethylene diphthalimidines are reported. The basicity of the phthalimidine nitrogen and also the halogen interchange of the N-(2-bromoethyl) phthalimidine are discussed.

Microfilm \$2.50; Xerox \$3.60. 65 pages.

PART A: SYNTHESIS AND REACTIONS OF SOME 2-BENZOYLCYCLANONES.

PART B: INFRARED AND ULTRAVIOLET SPECTRA OF SOME 2-BENZOYLCYCLANONES AND RELATED COMPOUNDS.

(L. C. Card No. Mic 59-5714)

Helmuth M. Gilow, Ph.D.
State University of Iowa, 1959

Chairman: Assistant Professor R. D. Campbell

PART A SYNTHESIS AND REACTIONS OF SOME 2-BENZOYLCYCLANONES

Nine new 2-arylcyclohexanones have been prepared by the basic condensation of a phenyl aroylate and cyclohexanone in yields of 72% to 41%.

Treatment of 2-(p-chlorobenzoyl)-cyclohexanone and 2-(m-chlorobenzoyl)-cyclohexanone with sodium hydroxide cleaved the cyclohexanone nucleus to form the corresponding ϵ -aroylcaproic acid. 2-(o-chlorobenzoyl)-cyclohexanone and 2-(o-methylbenzoyl)-cyclohexanone when treated in the same manner gave only starting material.

2-(o-chlorobenzoyl)-cyclohexanone when treated with diazomethane formed 1-(o-chlorobenzoyl)-2-methoxycyclohexene (X) and 2-(α -methoxy-o-chlorobenzal)-cyclohexanone (XII) in a 26 to 74 ratio respectively. The structures of the methyl ethers were determined by reducing the carbonyl group to the hydroxyl group with sodium borohydride. This was followed by cleavage of the methyl ether with acid, ketonization, and dehydration of the resulting β -hydroxy ketone. Treatment of X and XII in this manner formed 2-(o-chlorobenzal)-cyclohexanone and 1-(o-chlorobenzoyl)-cyclohexene respectively. A known stable methyl ether (β -methoxy-o-chlorobenzalacetophenone) was treated in the same manner to establish the reaction series.

2-Benzoyltetralone and 2-benzoylindanone when treated with diazomethane formed only a yellow oil. Treatment of the crude methyl ethers of both of the diketones with sodium borohydride and then acid gave a 72.6% yield of 2-benzal-1-tetralone and 59% yield of 2-benzal-1-indanone respectively.

Comparison of the enolic content of the cyclanones prepared indicates that substitution in the meta and para positions of 2-benzoylcyclohexanone has little effect on the equilibrium. Substitution in the ortho position shifts the equilibrium considerably towards the enol form in methanol.

PART B
INFRARED AND ULTRAVIOLET SPECTRA
OF SOME 2-BENZOYL-CYCLOANONES
AND RELATED COMPOUNDS

The keto form of all of the 2-arylcyloanones studied showed a strong absorption in the 245 $m\mu$ region. A strong absorption in the 310 $m\mu$ region is attributed to the enol form. The enol form of 2-benzoyltetralone and 2-benzoylindanone absorb at a longer wavelength.

Substitution of an electron donor group in the *para* position of the aromatic nucleus of 2-benzoylcyclohexanone shifts the benzoyl absorption to a longer wavelength. Substitution in the *meta* position has little effect on the wavelength of absorption. If, however, a group is substituted in the *ortho* position the absorption in the 245 $m\mu$ region is very low and the intensity of the enol absorption is greatly increased.

The methyl ethers of the enol forms and the corresponding chalcones were found to absorb at a lower wavelength than the enol forms.

The pure keto, enol and an equilibrium mixture of 2-(2-naphthoyl)-cyclohexanone were observed in the infrared. The enol shows a very intense and broad band at 1615-1570 cm^{-1} . An equilibrium mixture of the two has both the broad absorption of the enol form and the two sharp bands of the keto form.

Para substitution of the aromatic ring of 2-benzoylcyclohexanone shifted the carbonyl absorption only slightly. In all cases of substitution in the *ortho* position of 2-benzoylcyclohexanone, only the broad band due to the enol-chelate absorption was observed.

Microfilm \$2.50; Xerox \$6.60. 137 pages.

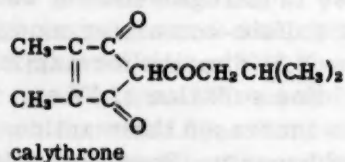
A STUDY OF CYCLOPENTENE-1,3-DIONES.

(L. C. Card No. Mic 60-506)

Eric Carl Juenge, Ph.D.
 New York University, 1957

Adviser: Dr. John J. Ritter

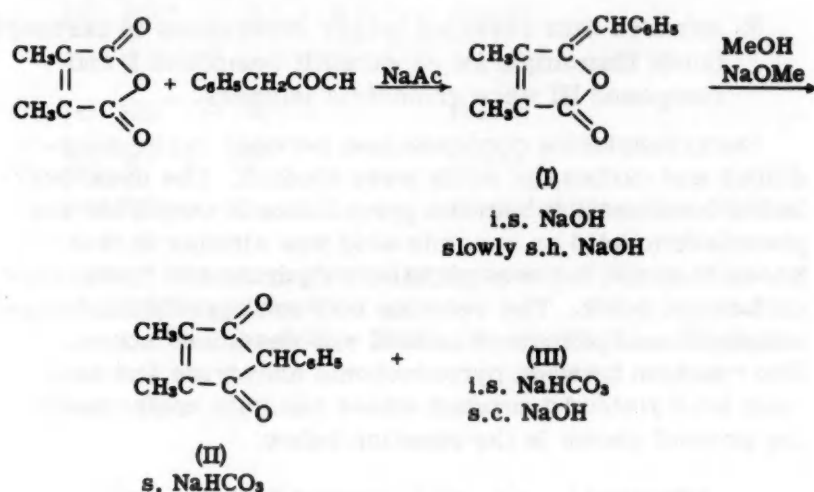
The purpose of this work was to study cyclopentene-1,3-diones and their preparation. A further object was to find a method of preparing cyclopentene-1,3-diones containing neither aromatic systems nor halogen atoms. Such a method might lead to a synthesis of the natural product calythrone. To the authors' knowledge, calythrone is the only known cyclopentene-1,3-dione containing neither aromatic systems nor halogen atoms.



Decarboxylative condensation reactions followed by rearrangements in basic environment have been tried as a means of preparing cyclopentene-1,3-diones. The decarboxylative condensations were conducted by heating an anhydride and a carboxylic acid at 220-240° with sodium acetate as catalyst. The rearrangements were

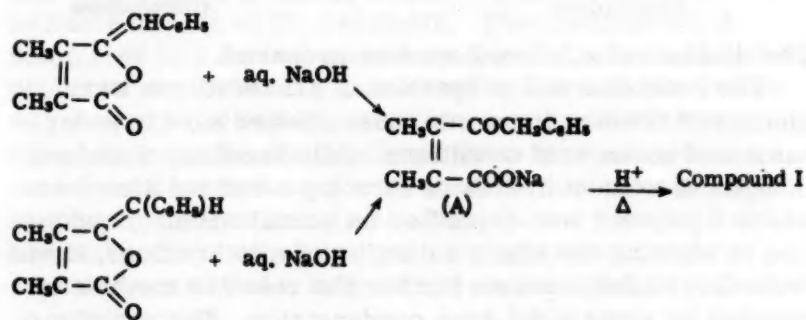
accomplished by refluxing with methanolic sodium methoxide.

A decarboxylative condensation of pyrocinchonic anhydride (4,5-dimethylcyclopentene-1,3-dione) with phenylacetic acid followed by rearrangement to a cyclopentene-1,3-dione was accomplished. The reaction between phenylacetic acid and pyrocinchonic anhydride resulted in the formation of benzalpyrocinchonide (I) which on treatment with boiling methanolic sodium methoxide yielded 4,5-dimethyl-2-phenylcyclopentene-1,3-dione (II) and another compound (III).



Thus, all three isomers (compounds I, II and III) involved in this rearrangement were prepared. The dioxime of compound II was prepared. Elemental analysis and molecular weight determination indicated that compound III is isomeric with compound I and compound II.

Compound I and compound III were interconverted which suggested that compound I and compound III might be geometric isomers. Compound III was obtained from compound I by treatment with alcoholic sodium methoxide. Aqueous hydrolysis of compound I followed by distillation resulted in the regeneration of compound I. If compound III was a geometric isomer of compound I, aqueous hydrolysis should give rise to the same product (A) obtained from compound I. Since hydrolysis of compound I followed by distillation was found to result in the regeneration of compound I, similar treatment of compound III should also result in the formation of compound I. This is illustrated in the formulae below.



When compound III was subjected to aqueous hydrolysis followed by distillation, compound I was formed. Although the structure of compound III has not been determined conclusively, a limited study of the compound was made and arguments in favor of and against the idea that compound I and compound III are geometric isomers are listed and discussed.

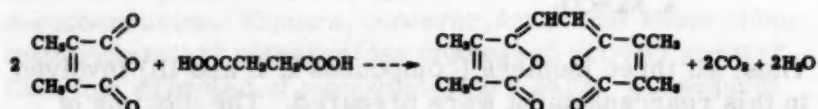
Arguments in favor of the idea that compound I and compound III are geometric isomers:

1. Limited number of possibilities
2. Interconversion of compound I and compound III

Arguments against the idea that compound I and compound III are geometric isomers:

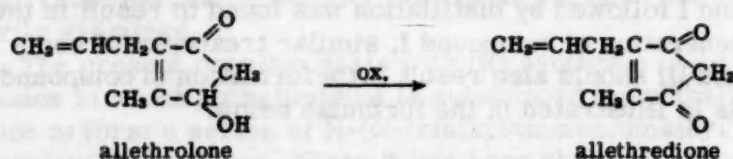
1. Ozonolysis of compound I resulted in the formation of benzaldehyde, while ozonolysis of compound III, under the same conditions, did not yield benzaldehyde.
2. Infrared data revealed larger differences in carbonyl bonds than might be expected if compound I and compound III were geometric isomers.

Decarboxylative condensations between cyclic anhydrides and carboxylic acids were studied. The decarboxylative condensation between pyrocinchonic anhydride and phenylacetic acid or succinic acid was similar to that known to occur between phthalic anhydride and these carboxylic acids. The reaction between pyrocinchonic anhydride and phenylacetic acid was described above. The reaction between pyrocinchonic anhydride and succinic acid yielded a product whose analysis conformed to the product shown in the equation below.



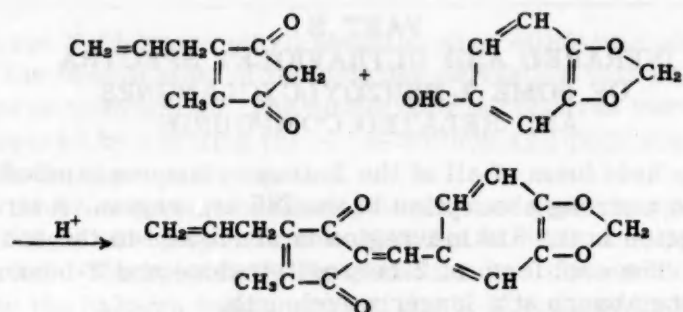
Only very small yields of product were obtained from a reaction between pyrocinchonic anhydride and cyanoacetic acid or a reaction between dichlormaleic anhydride and phenylacetic acid.

A method was found to prepare a cyclopentene-1,3-dione not containing aromatic systems or halogen atoms. It consisted of the oxidation of a cyclopentenolone with continual removal of the product, a cyclopentenedione, by steam-distillation. The method could be fruitful since many cyclopentenolones are reported in the literature. The compound selected for this study was allethrolone.



The dioxime of allethredione was prepared.

The reactions and properties of allethredione were discussed dividing them into those studied mostly under basic and under acid conditions. Allethredione dissolved in aqueous sodium hydroxide forming a red solution from which a polymer was deposited on acidification. In addition to showing the alkali solubility of allethredione, it was desirable to demonstrate further the reactive methylene position by some aldol-type condensation. The reaction between allethredione and piperonal with pyridine or piperidine as catalyst yielded polymers. Since allethredione often polymerized in basic environment, but was more stable in acid environment, acid catalysis was tried in the reaction. Sulfuric acid was found to act as a catalyst for the preparation of piperonylidine allethredione, shown in the following equation.



Microfilm \$2.50; Xerox \$3.80. 70 pages.

CHONDROITIN SULFATE MODIFICATIONS

(L. C. Card No. Mic 60-756)

Bienvenido Ochoa Juliano, Ph.D.
The Ohio State University, 1959

Carboxyl-reduced chondroitin (I) was prepared by exhaustive sodium borohydride reduction of chondroitin methyl ester in borate buffer. Partial acid hydrolysis of I, N-acetylation and carbon column fractionation of the hydrolyzate facilitated the isolation and characterization of D-glucose, 2-acetamido-2-deoxy- α -D-galactose monohydrate and the sole disaccharide, 3-O- β -D-glucopyranosyl-2-acetamido-2-deoxy- α -D-galactose dihydrate (II), a new compound. This demonstrated that β -D-glucopyranosidic linkages were more resistant to acid cleavage than 2-acetamido-2-deoxy- β -D-galactopyranosidic linkages in I. Substance II ($R_{\text{glucose}} 0.74$) was readily degraded in alkaline solution to D-glucose and a Morgan-Elson reactive sugar ($R_{\text{glucose}} 1.8$), "anhydro-N-acetyl-D-galactosamine," different from 2-acetamido-2-deoxy-D-galactose ($R_{\text{glucose}} 1.2$).

Sodium borohydride treatment II gave the alditol (III), which was chromatographically identical in three solvent systems with 3-O- β -D-glucopyranosyl-2-acetamido-2-deoxy-D-galactitol derived from chondrosine. Substance III ($R_{\text{glucose}} 0.76$) was resistant to alkaline degradation. 2-Acetamido-2-deoxy-glycitol, including III, were shown to be new exceptions to the Morgan-Elson test for 2-acetamido-2-deoxy-glycoses.

The nature of hydrazine reaction with chondroitin sulfate A (IV) has been studied. Hydrazine treatment of IV (barium salt) gave partially desulfated, highly (59-68%) N-deacetylated IV. The nature of the inorganic cation and desulfation of IV had negligible effects on the efficiency of the reaction. However, I showed low (29%) N-deacetylation, denoting that the absence of anionic groups, specifically carboxylate, adversely affected the efficiency of the reaction. Increase in nitrogen content was noted also with uronate- and sulfate-containing modifications of IV.

Sulfur trioxide-N,N-dimethylformamide and chlorosulfonic acid-pyridine sulfation of IV and its N-deacetylated modifications increased their anticoagulant activity to only 15% that of heparin. However, prior N-deacetylation of IV with hydrazine did not improve the activity of the sulfated preparation (sodium salt). No direct relationship was evident between the degree of sulfation and anticoagulant activity. The absence of the $1,560 \text{ cm}^{-1}$ band in the infrared was confirmed as characteristic of

the sulfoamino function as against the acetamido group in mucopolysaccharides.

Crude keratosulfate isolated from commercial IV showed bands at 775, 820 and 998 cm^{-1} in the infrared, consistent for an equatorial sulfate group. It was only partially desulfated with methanolic hydrogen chloride.

Microfilm \$2.50; Xerox \$6.20. 127 pages.

KINETICS OF THE ACID-CATALYZED
REARRANGEMENT OF
TETRA-p-TOLYLETHANEDIOL,
TETRA-p-TOLYLETHYLENE OXIDE AND
1,2-DIPHENYL-1,2-DI-o-TOLYLETHANEDIOL.

(L. C. Card No. Mic 60-348)

Hans Low, Ph.D.
St. Louis University, 1959

This study dealt with the acid-catalyzed rearrangement in aqueous acetic acid of tetra-p-tolyethanediol (I), tetra-p-tolyethylene oxide (II) and 1,2-diphenyl-1,2-di-o-tolyethanediol (III). In the kinetic measurements the progress of reaction was followed by analyzing for the diol with lead tetraacetate and for the pinacolone by a spectrophotometric method.

The three reactions were found to be kinetically of first-order in the substrate concentration and in the perchloric acid catalyst concentration if the composition of the medium was otherwise constant. Variation of the water content of the solvent over the range of 0 to 4% by weight or in the concentration of perchloric acid catalyst produced changes in reaction rate which correlated quantitatively with the acidity of the solvent as measured by the Hammett- H_0 acidity function. This correlation is consistent with a mechanism in which an initial equilibrium proton transfer to the diol is followed by the rate-determining conversion of the oxonium ion into a carbonium ion and a water molecule.

The para-substituted pinacol was found to rearrange by two kinetically distinguishable routes, one leading directly to the pinacolone and the other going through an epoxide intermediate. Twice as much oxide as pinacolone was formed within a given time, but since the oxide reacted at twice the rate of the diol, relatively little of the intermediate accumulated. The faster rate of the oxide relative to the pinacol can be attributed to the favorable energetics of the ring opening which is accompanied by a relief of bond angle strain and by a larger entropy gain than that accompanying the ionization of the glycol. Experimental evidence indicates that the entropy factor is the more important of the two.

The ortho-substituted pinacol was observed to rearrange at a rate which was slower than that of I by a factor of 370 and is also slower than the reaction of the unsubstituted tetraphenylethanediol by a factor of approximately 2. The kinetic data indicated that no significant amount of the ethylene oxide intermediate was involved in this rearrangement. Infrared spectra of samples of partially rearranged ortho-pinacol supported this conclusion. The reason for the slower rate relative to tetraphenylethanediol and the absence of oxide formation probably lies in the reduced stability of the carbonium ion. This lower

stability may be attributed to the diminished resonance energy of the carbonium ion arising from the inability of the phenyl and orthotolyl groups to become coplanar. It was also confirmed that the rearrangement occurs with exclusive phenyl migration the migratory tendency of the o-tolyl group being below the limit of detection of the analytical method.

A mechanism consistent with the experimental observations is proposed where P, E, K and R^+ represent the pinacol, oxide, pinacolone and carbonium ion, respectively.

- (1) $P + H^+ \rightleftharpoons PH^+$ (equilibrium)
- (2) $PH^+ \rightarrow R^+ + H_2O$ (slow)
- (3) $E + H^+ \rightleftharpoons EH^+$ (equilibrium)
- (4) $EH^+ \rightarrow R^+$ (slow)
- (5) $R^+ \rightarrow EH^+$ (fast)
- (6) $R^+ \rightarrow K + H^+$ (fast; slower than 5)

Reactions 1-6 are applicable to compounds (I) and (II), equations 1,2 and 6 to (III).

Microfilm \$2.50; Xerox \$6.00. 124 pages.

THE JET FLUORINATION OF ALIPHATIC
HYDROCARBONS AS ORIENTED AND
CONTROLLED BY OPERATING CONDITIONS

(L. C. Card No. Mic 60-472)

Abe Forest Maxwell, Ph.D.
Duke University, 1959

Supervisor: Lucius A. Bigelow

The chief purpose of this investigation was to study further the orientation of direct fluorination reactions toward individual products in acceptable yields by means of the new jet fluorination reactors. A secondary objective has been to observe the influence upon such reactions of progressive change in the experimental variables involved.

In jet fluorination a diluted gas sample is introduced through a turbulent jet into a chamber containing fluorine diluted by relatively inert reactor gases and continuously circulated by jet pump action, thus producing efficient and intimate mixing of the reactants. The fluorination is completed in a heated secondary reactor, after which the products are ultimately condensed and rectified. In this way a very mild vapor phase fluorination of an organic compound may be accomplished by an inexpensive, convenient and continuous process with a minimum of either cleavage or polymerization. Even milder reactions can be obtained in a triple jet unit in which the secondary reactor consists of a long coil of copper tubing which can be refrigerated.

Six relatively simple hydrocarbons, methane, ethane, propane, n-butane, isobutane and neopentane were fluorinated under a wide variety of operating conditions. The results expressed as liquid volume percent of total condensate are as follows. Of the possible perfluoro compounds there were obtained: CF_3CF_3 , 85, $CF_3CF_2CF_3$, 85, $CF_3CF_2CF_2CF_3$, 89, $(CF_3)_3CF$ 88%, while $(CF_3)_4C$ could not be obtained under any conditions. The corresponding

monohydro derivatives isolated were $\text{CF}_3\text{CF}_2\text{CHF}_2$ 46, $(\text{CF}_3)_2\text{CFCHF}_2$ 41, and $(\text{CF}_3)_3\text{CCHF}_2$ 39%; while the dihydro derivatives (mixtures of isomers) were $\text{C}_3\text{H}_2\text{F}_6$ 50, iso- $\text{C}_4\text{H}_2\text{F}_8$ 35, and neo- $\text{C}_5\text{H}_2\text{F}_{10}$ 21%. Very mild fluorination produced CH_3F 67, CH_2F_2 45 and $\text{CH}_3\text{CH}_2\text{F}$ 36%.

The experimental variables which have been studied are the nature of the sample, the fluorination ratio, the dilution ratio, the reactor temperatures and the molar flow rate.

If the chemical structure permitted the formation of many isomers or easy dehydrofluorination, the complex mixture of products became difficult to rectify even with precision equipment. Also as the molecular weight increased requiring many fluorine atoms to be crowded into a single molecule, the vigor of the reaction had to be stepped up, thus increasing the tendency toward cleavage and combustion. Fluorinated neopentane was a mixture of subliming solids requiring special treatment.

The highly important molar fluorination ratio (F_2 : sample) could be used to effectively direct the reaction to any desired fluorination level regardless of the other variables. However, it must be adjusted with care since too high a ratio favored combustion and too low a value often induced polymerization.

The dilution ratio, though secondary, was an important and rather critical variable. Increasing dilution moderated the reactions by increasing turbulence, jet pump action, heat dissipation and finally by speeding the reactant gases through the unit. However, excessive dilution opposed this moderating effect by increasing back pressure, thus crowding the reacting molecules together and tending to produce combustion.

The temperature must often be quite high to obtain completely fluorinated products and also to avoid the accumulation of critical concentrations of unreacted sample within the unit and consequent combustion. However, relatively low temperatures may be required when only one or two atoms of fluorine per mole of sample were to be introduced.

The sample flow rate which determines the actual quantity of reactants in the system and, therefore, the heat liberated, should for the mildest conditions be kept as low as possible without increasing the necessary operating time unreasonably.

The careful control of these variables made possible the results just described, and similar considerations should be applicable to the vapor phase jet fluorination of many types of organic compounds.

Microfilm \$2.50; Xerox \$4.40. 86 pages.

THE STEREOSPECIFIC SYNTHESIS OF SOME GEOMETRICALLY ISOMERIC TETRAMETHYLCYCLOPENTANES

(L. C. Card No. Mic 60-775)

Harold Nelson Miller, Ph.D.
The Ohio State University, 1959

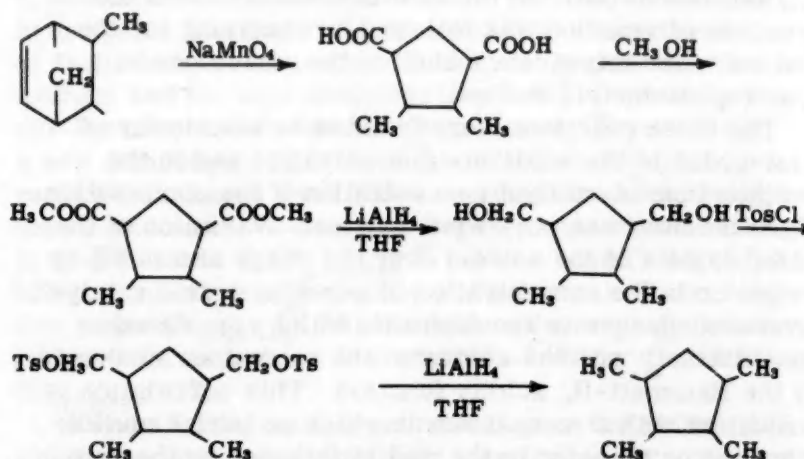
The geometrically isomeric 1,2,3,4-tetramethylcyclopentanes comprise a little known group of hydrocarbons. Of the six isomers only the 1,trans-2,cis-3,trans-4-tetra-

methylcyclopentane, obtained from a representative petroleum, has been reported in the literature.

- I 1,cis-2,cis-3,cis-4-Tetramethylcyclopentane
- II 1,trans-2,trans-3,cis-4-Tetramethylcyclopentane
- III 1,cis-2,trans-3,cis-4-Tetramethylcyclopentane
- IV 1,cis-2,cis-3,trans-4-Tetramethylcyclopentane
- V 1,cis-2,trans-3,trans-4-Tetramethylcyclopentane
- VI 1,trans-2,cis-3,trans-4-Tetramethylcyclopentane

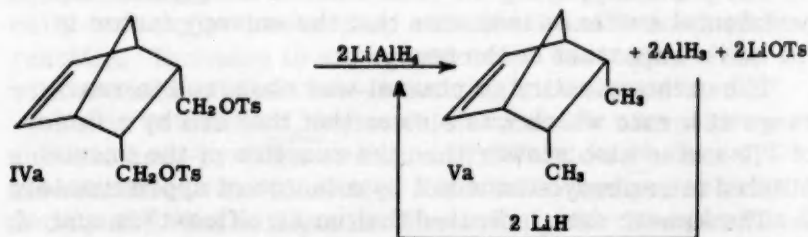
The present research describes the individual stereospecific synthesis of the first three isomers listed above. Definitive physical constants and an infrared spectrogram are reported for each isomer.

The stereospecific synthesis employed was the individual conversion of cis-4,cis-5-dimethyl-1,cis-3-cyclopentanedicarboxylic acid, trans-4,trans-5-dimethyl-1,cis-3-cyclopentanedicarboxylic acid and cis-4,trans-5-dimethyl-1,cis-3-cyclopentanedicarboxylic acid, obtained from the oxidation endo-cis-2,3-dimethyl-5-norbornene, exo-cis-2,3-dimethyl-5-norbornene and trans-2,3-dimethyl-5-norbornene, respectively, into the corresponding 1,2,3,4-tetramethylcyclopentanes (I,II,III). The reaction sequence employed for each isomer is depicted as follows.



The dimethyl norbornenes (isosantenenes) were synthesized according to a procedure, somewhat modified to suit the present situation, originated by K. Alder, W. Roth and A. Grell [Chem. Ber., 88, 407 (1955)].

The conventional lithium aluminum hydride hydrogenolysis of p-toluenesulfonates failed to work in both the dimethyl norbornene and the 1,2,3,4-tetramethylcyclopentane syntheses. A modified lithium hydride-lithium aluminum hydride hydrogenolysis procedure was successfully developed. The reaction may be represented as follows, showing the regeneration of the lithium aluminum hydride carrier.



The high purities of the dimethyl norbornenes (99%) and the tetramethylcyclopentanes (I,II,III) tend to substantiate the stereospecificity of the reactions involved in their syntheses.

PHYSICAL PROPERTIES OF THE
1,2,3,4-TETRAMETHYLCYCLOPENTANES

Property	Compound		
	I	II	III
b.p. ⁷⁶⁰	147.30°C.	133.86°C.	134.53°C.
n _D ²⁰	1.4332	1.4208	1.4219
d ₄ ²⁰	0.7924	0.7669	0.7687
Purity	99.6%	99.1%	96 %

Microfilm \$2.50; Xerox \$5.40. 110 pages.

THE SYNTHESIS OF ESTERS OF
p-CARBOXYPHENYLPHENYL CARBINOLS
AND THE STRUCTURE AND PROPERTIES OF
3,4-PHENACYLIDENE-3-ACETYLCOUMARIN.

(L. C. Card No. Mic 59-3810)

Charles Edward Morreal, Ph.D.
State University of Iowa, 1959

Chairman: Stanley Wawzonek

Part I
The Synthesis of Esters of
p-Carboxyphenylphenylcarbinols

Diethylaminoethyl esters of p-carboxyphenylphenylcarbinols are related by the principle of vinylogy to the corresponding esters of substituted mandelic acids which are utilized clinically as antispasmodic drugs.

The diethylaminoethyl ester of p-carboxybenzohydrol was prepared from p-carboxybenzohydrol and β-chloroethyl-diethylamine. The diethylaminoethyl ester of diphenyl-p-carboxyphenylcarbinol also was prepared from the corresponding acid and β-chloroethyl-diethylamine.

The applicability of the Grignard reaction was demonstrated by the addition of ethylmagnesium iodide to freshly distilled diethylaminoethyl ester of p-benzoylbenzoic acid to yield the diethylaminoethyl ester of ethylphenyl-p-carboxyphenylcarbinol.

Part II
The Structure and Properties of
3,4-Phenacylidene-3-acetylcoumarin

3,4-Phenacylidene-3-acetylcoumarin was prepared from 3-acetylcoumarin and phenacyl bromide in the presence of sodium ethoxide. Its structure was elucidated by reference to its infrared spectrum and by its synthesis from 3-acetylcoumarin and diazoacetophenone.

The phenacylidene compound was hydrogenated in the presence of Adam's platinum catalyst to give a compound C₁₉H₂₃O₄ which was not characterized. The influence of cold sodium ethoxide on 3,4-phenacylidene-3-acetylcoumarin was also studied.

In hot sodium hydroxide, 3,4-phenacylidene-3-acetylcoumarin is degraded to a compound which originally was thought to be 4,5-salicylidene-3-phenyl-2-cyclopenten-1-

one. The absence of fused cyclopropane and cyclopentene rings was demonstrated by the inertness of this compound to potassium t-butoxide. The degradation product was shown to be 4-(o-hydroxybenzal)-3-phenyl-2-cyclopenten-1-one.

The hydroxy compound was converted into 4-(o-methoxybenzal)-3-phenyl-2-cyclopenten-1-one by treatment with dimethyl sulfate. Although the active methylene group in the methoxycyclopentenone did not condense with o-methoxybenzaldehyde in the presence of bases, selenium dioxide oxidation converted the compound into 5-(o-methoxybenzal)-4-phenyl-3-cyclopenten-1,2-dione, which formed a phenazine with o-phenylenediamine.

Cleavage of the diketone by hydrogen peroxide gave β-phenyl-α-(o-methoxybenzal)glutaconic acid. The glutaconic acid derivative also was synthesized from β-phenylglutaconic acid and o-methoxybenzaldehyde in the presence of sodium methoxide.

Hydrogen in the presence of Adam's platinum catalyst converted 4-(o-methoxybenzal)-3-phenyl-2-cyclopenten-1-one into 4-(o-methoxybenzyl)-3-phenylcyclopentanone.

3,4-Phenacylidene-3-carbethoxycoumarin was prepared from 3-carbethoxycoumarin and phenacyl bromide. It was hydrolyzed in sodium hydroxide to phenacylmalonic acid and salicylaldehyde.

Microfilm \$2.50; Xerox \$4.60. 90 pages.

REARRANGEMENT OF sec-ALKYL
N,N-DICHLOROAMINES, N-CHLORO IMINES,
AND N-CHLORO IMINO ESTERS.

(L. C. Card No. Mic 60-126)

James Maynard Petersen, Ph.D.
The University of Nebraska, 1959

Adviser: Henry E. Baumgarten

From the rearrangement of sec-alkyl N,N-dichloroamines with methanolic sodium methoxide followed by acid hydrolysis, five p-substituted phenacylamines have been prepared; p-bromophenacylamine, p-chlorophenacylamine, p-methoxyphenacylamine, p-methylphenacylamine, and p-phenylphenacylamine. The respective yields are 72.5, 60, 73, 72, and 71%. By the same reaction sequence β-amino-α-tetralone hydrochloride and desylamine hydrochloride were prepared in 63% and 45% respectively. These yields either exceed or are comparable with those reported for the same amino ketones by other known but more complicated synthetic routes.

From the rearrangement of N-chloro phenyl benzyl ketimine under essentially the same conditions desylamine hydrochloride was obtained in 65% yield. This sequence represents a new synthetic route to α-amino ketones involving the following successive steps, condensation of a nitrile with a Grignard or other organometallic reagent, halogenation of the resultant imine, rearrangement with a sodium alkoxide and acid hydrolysis. The yield of α-amino ketone was higher than obtained by the rearrangement of the sec-alkyl N,N-dichloramine.

The mechanism proposed for the N,N-dichloroamine rearrangement parallels very closely the mechanism of

the Neber rearrangement that has been established recently by Hatch and Cram. They were able to isolate temperature labile intermediates of the reaction sequence. In the present work reduction with lithium aluminum hydride of the intermediate in the reaction of N,N-dichloro-1,2-diphenylethylamine gave *cis*-2,3-diphenylethylenimine in 43% yield. This result together with the result of the N-chloro imine rearrangement confirm the suggested mechanism. *cis*-2,3-Diphenylethylenimine was also obtained (in 48% yield) from the rearrangement followed by reduction of phenyl benzyl N-chloro ketimine.

The limited study of the rearrangement of N-chloro imino esters has shown that in at least one example they will undergo rearrangement and produce the desired amino acid. From the rearrangement of N-chloro methyl phenyl iminoacetate with sodium methoxide followed by acid hydrolysis and neutralization with ammonia, α -amino-phenylacetic acid was obtained in 14% yield. Although the reaction does not produce amino acid in yields competitive with known methods of preparation, it does demonstrate the scope of the rearrangement and offers incentive for future study of this reaction.

Microfilm \$2.50; Xerox \$4.20. 77 pages.

REACTIONS OF 5-HALOBENZO(a)BIPHENYLENES

(L. C. Card No. Mic 60-788)

Kenneth Wayne Ratts, Ph.D.
The Ohio State University, 1959

5-Halobenzo(a)biphenylenes possess the interesting cyclobutadiene system in their molecular structures. In addition, these halo compounds are easily accessible by synthetic routes. Because of their interesting structure, good synthetic accessibility, and reasonable stability, a study of their reactions was initiated.

5-Iodobenzo(a)biphenylene was prepared by treatment of 1,2-diiodobenzocyclobutene with potassium *tert*-butoxide. Thus, 5-iodobenzo(a)biphenylene was readily available in reasonable quantities since improvements had been made in the synthesis, in a good state of purity, of 1,2-diiodobenzocyclobutene.

Metal exchange reactions of 5-iodobenzo(a)biphenylene with butyllithium or methylmagnesium iodide gave the corresponding lithium and magnesium iodide derivatives. Carbonation of these derivatives gave, after hydrolysis, benzo(a)biphenylene-5-carboxylic acid. Through the acid chloride of this acid, its amide and methyl ester, as well as the 5-acetyl derivative of benzo(a)biphenylene, were prepared. 5-Cyanobenzo(a)biphenylene was prepared by the action of cuprous cyanide on 5-iodobenzo(a)biphenylene. Hydrolysis of this nitrile gave the amide of benzo(a)biphenylene-5-carboxylic acid. 5-Acetylbenzo(a)biphenylene was also prepared by the action of methylmagnesium iodide on this nitrile.

Attempted Friedel-Crafts reactions on benzo(a)biphenylene gave mixtures of unidentified red oils, not one of which was 5-acetylbenzo(a)biphenylene.

Vigorous oxidation of the 5-halobenzo(a)biphenylenes gave benzophenone-2,2'-dicarboxylic acid. Milder oxidation afforded unstable neutral intermediates, assigned the

composition of 3,8-dioxo-6-halo-1,2,4,5-dibenzocycloocta-1,4,6-trienes.

Treatment of the cyclooctatrienes with either acid or base caused a transannular ring closure to occur. The resulting derivatives of 3,4,7,8-tetrahydro-1,2,5,6-dibenzopentalene were related to known similar substances.

An attempt to prepare a quinone of an unknown 1,2,5,6-dibenzopentalene, by dehydration of one of the above prepared compounds, gave a dimer of unknown constitution.

Microfilm \$2.50; Xerox \$5.20. 103 pages.

A. A MICROCHEMICAL INVESTIGATION OF PLANTS POSSESSING ANTIBACTERIAL ACTIVITY. B. MICROSYNTHESIS WITH DIAZOMETHANE.

(L. C. Card No. Mic 60-516)

Robert Roper, Ph.D.
New York University, 1957

Adviser: Professor T. S. Ma

Part A. A Microchemical Investigation of Plants Possessing Antibacterial Activity.

The plant species *Schizandra chinensis* and *Cissus japonica* were shown to possess *in vitro* antitubercular activity. By means of solvent extraction, ion exchange adsorption, paper chromatography, and bioassay, the biologically active material was isolated and identified as citric acid and malic acid.

In a comparison of a number of carboxylic acids, citric acid was found to possess a higher order of antitubercular activity than the other acids tested. This activity seemed to be not merely a manifestation of hydrogen ion activity.

The hydrazides of citric acid, succinic acid, tartaric acid and malic acid were prepared, and were found to possess about twice the antitubercular activity as the corresponding acids.

In the development of a quantitative paper-chromatographic method for plant acids, a number of procedures were studied. The method adopted involved the measurement of the optical density of chromatographic spots by means of the Beckman DU spectrophotometer in conjunction with a specially constructed attachment. The method was used to measure the acid content of *S. chinensis* and *C. japonica*.

Part B. Microsyntheses with Diazomethane.

The following syntheses with diazomethane were carried out in the microscale: (a) the methylation of carboxylic acids and arylphosphonic acids; (b) the preparation of diazoketones from acyl chlorides; and (c) the preparation of 4,5-dicarbomethoxypyrazoline. The methyl esters of several carboxylic acids were converted to hydrazides. A number of ω -diaoacetophenones were acetylated to form ω -acetoxyacetophenones. *p*-Methoxy- ω -diaoacetophenone was subjected to the Arndt-Eistert rearrangement to yield *p*-methoxyphenylacetamide.

Diazomethane gas was generated by means of a micro-apparatus constructed for that purpose. It could be used to introduce the gas directly into the reaction mixture, or to prepare ethereal solutions of diazomethane. Micro-distillation and microrecrystallization techniques were used to obtain maximum yields. The yields of the micro-syntheses were compared to yields reported for parallel reactions on the macroscale, and were found to be satisfactory in most cases, although lower than those of macro-syntheses. The danger of explosion and toxicity was reduced in these microprocedures.

Microfilm \$2.50; Xerox \$6.60. 138 pages.

SYNTHESIS AND PROPERTIES OF BRIDGEHEAD-NITROGEN BICYCLIC COMPOUNDS

(L. C. Card No. Mic 60-791)

Paul David Schickedantz, Ph.D.
The Ohio State University, 1959

In order to estimate steric effects on mesomerism in aromatic amines, two representatives of a new class of aromatic bicyclic amines which contain nitrogen at a bridgehead position were synthesized. These compounds are 3,4-dihydro-2H-1,4-methanoquinoline (I) and 6-chloro-3,4-dihydro-2H-1,4-methanoquinoline (II).

Compound I was prepared by intramolecular alkylation of 3-(2-bromoethyl)indoline hydrobromide upon addition to aqueous sodium hydroxide. Compound I could not be synthesized by intramolecular alkylation of 4-bromo-methyl-1,2,3,4-tetrahydroquinoline hydrobromide (III); the principal product was polymeric. II was obtained by intramolecular alkylation of 5-chloro-3-(2-bromoethyl)-indoline hydrobromide. Methods of synthesis of 3-(2-bromoethyl)indoline hydrobromide and 5-chloro-3-(2-bromoethyl)indoline hydrobromide were developed.

From a comparison of the ultraviolet spectra of I and II with bicyclic aromatic amines and aromatic hydrocarbons, and from a comparison of their base strengths (pK_a 25° in H_2O , I = 7.20, II = 6.55) with aromatic and non-aromatic bicyclic bridgehead amines, it was determined that mesomerism in I and II is extensively prohibited.

The base strengths of quinuclidine (IV) (pK_a 25° in H_2O , 11.10) and 1-azabicyclo (2.2.1) heptane (V) (pK_a 25° in H_2O , 10.71) were measured. In order to explain their relative basicities O-strain (orbital strain) was postulated. The importance of steric hindrance to solvation as a factor in determining the base strengths of tertiary amines was emphasized.

Attempts to prepare tribenzoquinuclidine by methods involving (1) reaction of acridine and benzoquinone, (2) reaction of acridine and benzyne, and (3) intramolecular arylation of 9,10-dihydro-9-(*m*-fluorophenyl)acridine were unsuccessful.

Microfilm \$2.55; Xerox \$9.00. 196 pages.

THERMAL DECOMPOSITION OF TRIS(ETHYLENEDIAMINE)CHROMIUM(III) HALIDES IN ORGANIC MEDIA

(L. C. Card No. Mic 59-2801)

Abraham Schwebel, Ph.D.
University of Maryland, 1958

Supervisor: Professor Carl L. Rollinson

Tris(ethylenediamine)chromium(III) chloride has been decomposed in boiling organic liquids, such as tetralin and dodecane, to cis-dichloro-bis(ethylenediamine)chromium(III) chloride. The reaction proceeds smoothly with yields as high as 98% of the pure dichloro salt. Neither water nor any compound such as NH_4Cl appears to be required for the reaction, in contrast with the decomposition of the luteo salt in an oven, in which both are necessary.

Tris(ethylenediamine)chromium(III) bromide does not thermally decompose in the same way, but reacts stoichiometrically with hexylamine hydrobromide in boiling tetralin or decalin to give excellent yields of cis-dibromobis(ethylenediamine)chromium(III) bromide. This procedure is the basis of a satisfactory method of preparing the cis-dibromo salt.

Tris(ethylenediamine)chromium(III) iodide could not be decomposed in a similar way to a di-iodo compound. An uncharacterized purple compound was obtained which appears to be a diol.

In attempts to prepare tris(ethylenediamine)chromium(III) fluoride, red syrups were obtained from which the pure luteo fluoride could not be isolated. When these syrups were subjected to the boiling tetralin treatment, an impure product was obtained from which a complex positive chromium ion and a complex negative chromium ion were obtained. The former appears to be cis- $[Cren_2F_2]^+$; the latter may be $[CrenF_4]^-$.

Two salts reported by Pfeiffer as cis- $[Cren_2H_4O_2Br]Br_2$ and cis- $[Cren_2(H_4O_2)_2]Br_2$ were prepared from cis- $[Cren_2Br_2]Br$. The results of dehydration experiments support Pfeiffer's conclusion that two water molecules occupy one coordination position in these compounds.

A new compound reported by Nilubol and assigned the formula cis- $[Cren_2Cl_2]Cl \cdot HCONH_2$ was prepared and analyzed. The composition reported by Nilubol was confirmed.

A method for determining ionic halogen in chromium complex compounds reported by Nilubol was refined and developed into a reliable analytical procedure. In addition to its application in determining the composition of chromium compounds, it was used in a preliminary study of the rate of aquation of cis- $[Cren_2Cl_2]Cl \cdot HCONH_2$ in dimethylformamide. Over a considerable range, the reaction is first order with respect to dichloro ion concentration. Microfilm \$2.50; Xerox \$7.00. 146 pages.

I. AN ISOCARBAZOLE SYNTHETIC APPROACH TO MORPHINE.

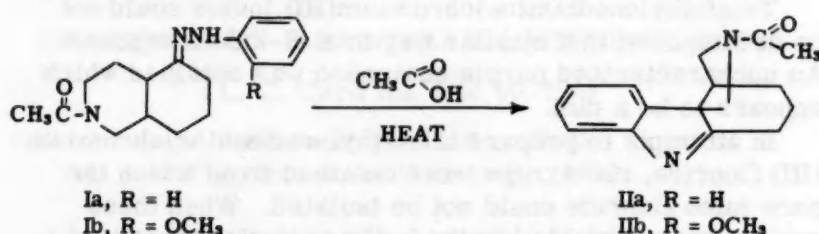
II. DIELS-ALDER REACTION ON ALKYL MERCAPTOTOLUQUINONES: A ROUTE TO ANGULARLY METHYLATED BICYCLIC SYSTEMS.

(L. C. Card No. Mic 60-454)

Louis Leonard Skaletzky, Ph.D.
Northwestern University, 1959

Supervisor: Vlasion Georgian

In Part I an approach to the total synthesis of morphine by a novel application of the Fischer indole or arylhydrazone rearrangement was presented. The arylhydrazone rearrangement as applied to bicyclic systems bearing a carbonyl function adjacent to the ring junction has opened a new synthetic route to this alkaloid. For example, N-acetyl-5-ketodecahydroisoquinoline phenylhydrazone (Ia) gave the isocarbazole (IIa). Extension of this rearrangement to the o-methoxyphenylhydrazone (Ib) would lead to (IIb). These substances have the gross structural features of the morphine molecule, i.e., the ethanamine chain attached to a benzyl quaternary carbon corresponding to C-13 of morphine.



Part I consists of a study of methods of preparation of isocarbazole precursors possessing an oxygen function which could be transformed by further synthetic manipulations into the 6-alcohol of morphine.

The compounds, decalin-1,2-dione 2-monoethylene ketal, decalin-1,2-dione 2-monoethylene hemithioketal and decalin-1,2-dione 2-monoethylene thioketal were synthesized in good yield from α -decalone. The arylhydrazone rearrangement of the phenylhydrazones of these ketones was studied.

Isocarbazoles can be transformed into enacetylamines by acetic anhydride and sodium acetate. These substances undergo abnormal reactions with peracids. Monoperphthalic acid in the presence of water was found to hydroxylate the double bond. Peracetic and perbenzoic acids gave cleavage of the double bond. Mechanisms for the cleavage and hydroxylation reactions are presented which are analogous to the mechanisms proposed for the reactions of steroidal enol ethers and enol acetates with peracids. The diols from the hydroxylation of the enacetylamines with monoperphthalic acid and water were rearranged to the desired ketones by p-toluenesulfonic acid in benzene or acetic anhydride followed by treatment of the diacetate with potassium hydroxide. For example, N-acetyl-11-methyl-1,10-dihydroxyhexahydrocarbazole was converted into N-acetyl-11-methyl-1-keto-1,2,3,4,10,11-hexahydrocarbazole.

In Part II, the Diels-Alder reaction of alkylmercapto-p-toluquinones and butadiene was studied and the structure of these adducts as angularly methylated substances was established on the basis of ultraviolet evidence. For

example, 6-methylmercapto-p-toluquinone and butadiene gave an excellent yield of the angularly methylated product cis-9-methyl-2-methylmercapto-5,8,9,10-tetrahydro-1,4-naphthoquinone. This adduct eliminates methyl mercaptan on zinc dust-acetic acid reduction to form 9-methyl-2,3,5,8,9,10-hexahydro-1,4-naphthoquinone. A mechanism was proposed for this desulfurization reaction.

Microfilm \$2.50; Xerox \$7.40. 160 pages.

REACTIONS OF BIS-DIAZOALKANES WITH CYCLIC KETONES

(L. C. Card No. Mic 60-64)

Terrill Dean Smith, Ph.D.
Washington University, 1959

Chairman: C. David Gutsche

The structures of some of the products resulting from the interaction of cyclopentanone on cyclohexanone with a series of bis-diazoalkanes have been elucidated and certain of the physical and chemical properties of these compounds have been studied. Three sets of reactants yielded bridged ring ketones; cyclohexanone and 1,3-bis-diazopropane gave 9-ketobicyclo [5.1.1] nonane; cyclohexanone and 1,4-bis-diazobutane yielded 10-ketobicyclo [5.2.1] decane; cyclopentanone and 1,4-bis-diazobutane produced 9-ketobicyclo [4.2.1] nonane. In addition to the bridged ring ketone, cyclohexanone and 1,3-bis-diazopropane also yielded the fused ring ketone, 2-ketobicyclo [6.1.0] nonane. The reaction between cyclohexanone and 1,5-bis-diazopentane yielded a fused ring ketone, 2-ketobicyclo [6.3.0] undecane, as the major product. In all instances, however, the crude reaction mixture contained a number of materials in addition to the bridged ring and/or fused ring compound. Those that were identified included keto-ethers, resulting from one-step ring enlargement combined with reaction with the solvent, and diketones resulting from the reaction of two moles of cycloalkanone with one mole of bis-diazoalkane. The reactions of cycloheptanone and 1,6-bis-diazoheptane were also carried out, but the mixtures which resulted were exceedingly complex and none of the components have been identified. Finally, the reaction of acetone with 1,4-bis-diazobutane was shown to yield a mixture containing, *inter alia*, 2,5-dimethylcyclopentanone.

The three bridged ring ketones were studied with respect to the applicability of Bredt's rule, and it was determined by means of bromination reactions, deuterium exchange studies, and cleavage reactions with sodium amide, that 10-ketobicyclo [5.2.1] decane "violates" Bredt's rule whereas its next lower homolog, 9-ketobicyclo [4.2.1] nonane, "obeys" it. Thus, the limiting case for the applicability of Bredt's rule to the ring system [x.2.1] has been established. 9-ketobicyclo [5.1.1] nonane was also found to "obey" Bredt's rule. The equilibrium between ketone hydrogen cyanide, and cyanohydrin was measured at three temperatures for the three bridged ring ketones and for the simple ketones cyclobutanone through cyclooctanone. Comparison of free energy values for the equilibrium and of the enthalpy and entropy contributions to the free energy proved to be puzzling and a

subject for further inquiry. Nuclear magnetic resonance spectra were obtained for the three bridged ring ketones, three fused ring ketones, and five simple cycloalkanones, and these provided further data in support of the structural assignments, particularly in the case of the isomeric 9-ketobicyclo [5.1.1] nonane and 2-ketobicyclo [6.1.0] nonane. Microfilm \$2.50; Xerox \$5.80. 120 pages.

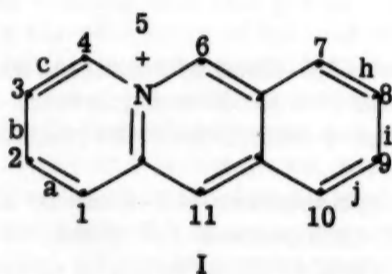
THE CHEMISTRY AND SYNTHESIS OF QUINOLIZINIUM BENZOLOGS

(L. C. Card No. Mic 60-273)

Thomas William Graham Solomons, Ph.D.
Duke University, 1959

Supervisor: Charles K. Bradsher

The acridizinium ion (I) has been found to undergo the Diels-Alder reaction when heated with maleic anhydride, maleate or fumarate esters or acrylonitrile. Ethyl maleate and fumarate yield the same product, which appears to be best explained by preliminary rearrangement of the maleate to the fumarate ester. Esterification of the acid obtained by ring opening of the anhydride adduct yielded esters unlike those obtained directly in the Diels-Alder reaction.



The first acridizinium salts having a substituent in position 11 have been synthesized by cyclization in liquid hydrogen fluoride of the 1-benzyl salts obtained from 2-benzoyl and 2-acetylpyridine. In the same way, the salt obtained by the quaternization of 2-benzoylpyridine with 1-phenylethyl bromide cyclized to yield a 6-methyl-11-phenylacridizinium derivative, in which both *meso* positions are occupied.

Similarly, benzacridizinium salts with a substituent in the central nucleus have been prepared by the acid-catalyzed cyclization of quaternary salts obtained by reaction of (1) 1-bromomethylnaphthalene with 2-pyridyl ketones or (2) benzyl (or naphthylmethyl) halides with 1-benzoylisoquinoline. The salts formed by route (1) cyclized readily in liquid hydrogen fluoride but in most cases those formed by route (2) required the more vigorous conditions of hot polyphosphoric acid.

Attempts to prepare the benz [b]acridizinium ion and its 2-methyl analog, by hydrobromic acid cyclization of the salts formed by the quaternization of isoquinoline-3-carboxaldehyde with benzyl bromide and p-methylbenzyl bromide, gave as the main products what appear to be dimeric forms of the benz [b]acridizinium salts. By using isoquinoline-3-aldoxime as the starting base in the same sequence, cyclization occurred more rapidly and the desired benz [b]acridizinium salts could be isolated in

appreciable quantities. These salts were found to dimerize readily when heated in hydrobromic acid or when irradiated with visible light. Spectral evidence indicates that the dimerization occurs in one of the inner rings.

Alkoxy derivatives of the benz [b]acridizinium ion were prepared by the acid catalyzed cyclization of the quaternary salts formed by the reaction of isoquinoline-3-carboxaldehyde with various alkoxybenzyl bromides. In all cases cyclization was facilitated by the presence of an alkoxy group *para* to the position of cyclization. Replacing the alkoxybenzyl bromides by either 1-bromo-methyl- or 2-bromomethylnaphthalene, in the same reaction scheme, provided a route to the dibenz [b,h]- and the dibenz [b,j]-acridizinium salts.

This dissertation also includes a literature review dealing with the synthesis of compounds containing the quinolizinium ring system.

Microfilm \$2.50; Xerox \$5.00. 100 pages.

PART I. THE ACID INDUCED REARRANGEMENT OF 8-ISOPROPYL-1-NAPHTHOIC ACID AND 8-ISOPROPYL-5,6,7,8-TETRAHYDRO-1-NAPHTHOIC ACID.

PART II. AN INVESTIGATION INTO THE NATURE OF THE REACTION OF 8-QUINOLINEBORONIC ACID AND CHLOROALCOHOLS.

(L. C. Card No. Mic 60-460)

William Joseph Vullo, Ph.D.
Northwestern University, 1959

Part I.

Naphthalic-1,8-anhydride was converted to 3,3-dimethyl-1,8-naphthalide (I) by reaction with two moles of methyllithium. Reduction of lactone I with nickel-aluminum alloy, after saponification in trimethylene glycol-potassium hydroxide, gave a mixture of 8-isopropyl-1-naphthoic acid (II) and 8-isopropyl-5,6,7,8-tetrahydro-1-naphthoic acid (III), which was separable by fractional crystallization from petroleum hexane.

Treatment of acid II with liquid hydrogen fluoride or concentrated sulfuric acid gave an aldal type compound, C₂₈H₂₆O₃ (IV), corresponding to the bimolecular dehydration product of the hemiacetal, 3,3-dimethyl-1-hydroxy-1H,3H-naphtho(1,8-c,d)pyran (V). Aldal IV gave a crystalline 2,4-dinitrophenylhydrazone, C₂₀H₁₈O₅N₄, and was oxidized to lactone I by chromic oxide and by N-bromosuccinimide.

Reduction of lactone I with lithium aluminum hydride gave hemiacetal V, which was converted to aldal IV by sulfuric acid. Also, hemiacetal V gave the same 2,4-dinitrophenylhydrazone as aldal IV.

The acid catalyzed rearrangement of 8-isopropyl-1-naphthoic acid is believed to be an intramolecular reaction (therefore, an example of a 1,5-hydride transfer reaction) since cumene and benzoyl chloride did not react under conditions in which I was converted in part to IV. Furthermore, a mixture of isopropyl-1-naphthoic acids, probably mainly the 5- and 6- isomers, was not converted to neutral products by sulfuric acid.

Treatment of acid III with liquid hydrogen fluoride or strong sulfuric acid gave an aldal type compound, $C_{28}H_{34}O_3$ (VI). Aldal VI was dehydrogenated over a palladium black catalyst to give lactone I. Aldal VI also gave a crystalline 2,4-dinitrophenylhydrazone, $C_{20}O_{22}O_5N_4$.

8-isopropyl-1,2,3,4-tetrahydro-1-naphthoic acid and o-isobutylbenzoic acid were synthesized. These compounds, although structurally similar to acids II and III, did not give neutral compounds when treated with strong sulfuric acid or liquid hydrogen fluoride.

Part II.

The reaction between 8-quinolineboronic acid and chloroalcohols (see R. L. Letsinger and S. H. Dandegaonker, *J. Am. Chem. Soc.*, **81**, 154 (1958)), has been found to be a hydrolysis reaction; 3-chloropropanol is converted to trimethylene glycol, and 2-chloropropanol gives ethylene glycol. The catalytic property of 8-quinolineboronic acid has been verified; acceleration of the rate of hydrolysis of the chloroalcohols occurs when 8-quinolineboronic acid is used in catalytic amounts, and the catalyst may be recovered from a reaction mixture.

In the absence of 8-quinolineboronic acid 2-chloroethanol does not give ethylene glycol, and 3-chloropropanol does not give isolatable quantities of trimethylene glycol. The products from the 3-chloropropanol appear to be polymeric.

The mode of action of 8-quinolineboronic acid may be likened to that of an enzyme. Thus, the rate of hydrolysis becomes independent of the concentration of substrate (chloroalcohol) at high concentrations of substrate, and competitive inhibition by product (glycol) is observed.

The rate of the 8-quinolineboronic acid catalyzed hydrolysis of 2-chloroethanol (and presumably of 3-chloropropanol, as well) is inhibited by the addition of large amounts of water. The rate of the non-catalyzed (blank) reaction, on the other hand, is increased by the addition of water.

The rate of hydrolysis of the above chloroalcohols is dependent on the concentration of the 8-quinolineboronic acid, the catalyst, to a power between 1 and 2; the average value from four determinations is about 1.6.

In view of the above findings it is concluded that 8-quinolineboronic acid belongs to the class of polyfunctional catalysts, the most significant members of which are enzymes. Microfilm \$2.50; Xerox \$6.60. 136 pages.

NEW FIVE MEMBERED RING CHEMISTRY

(L. C. Card No. Mic 60-597)

Edward Felix Zaweski, Ph.D.

Iowa State University of Science and Technology, 1959

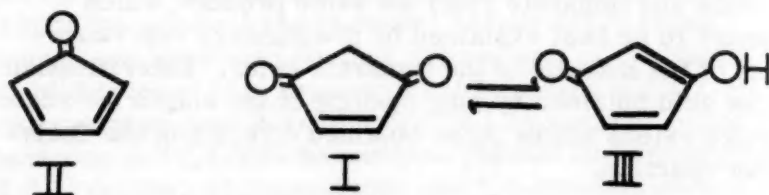
Supervisor: C. H. DePuy

This dissertation is concerned with the synthesis and properties of cyclopentene-3,5-dione I. This molecule is of interest not only for theoretical reasons but also as a starting material for the preparation of other mole-

cules of practical importance. The 3,5-dione was synthesized by a chromic acid oxidation of cyclopentene-3,5-diol, which was obtained by the bromination of cyclopentadiene, conversion of the 3,5-dibromide to the 3,5-diacetate with tetraethylammonium acetate and hydrolysis of the subsequent diacetate with $Ba(OH)_2$ in ethanol. The 3,5-dione was also obtained by the chromic acid oxidation of the commercially available cyclopentendiols.

Cyclopentene-3,5-dione is a yellow, volatile solid melting at $37-38^\circ C$ and soluble in water and most organic solvents except hydrocarbons. It contains three functional groups which undergo chemical reactions readily.

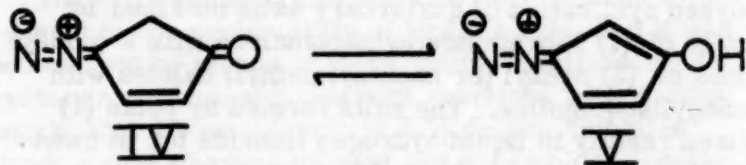
The 3,5-dione is an interesting compound for theoretical reasons because of its relationship to the hitherto unknown molecule cyclopentadienone II. Significantly, cyclopentene-3,5-dione is completely ketonic, and less acidic than the saturated dione. It is suggested that the enol form, and the enolate anion, are difficult to form because they contain cyclopentadienone rings, and that this principle will appear in the chemistry of other unsaturated five-membered ring compounds.



Chemically, the 3,5-dione is reactive, condensing with itself in basic solutions to form a polymer. In aqueous acid solutions, the 4-benzylidene derivative can be obtained.

Reduction of cyclopentene-3,5-dione by zinc dust in acetic acid gives cyclopentane-1,3-dione, while catalytic reduction yields roughly equal amounts of cyclopentanone and β -hydroxycyclopentanone and less than 2% of cyclopentane-1,3-dione.

Cyclopentene-3,5-dione undergoes Diels-Alder reactions readily with cyclopentadiene, anthracene and other dienes. It also forms mono- and/or dicarbonyl derivatives readily. An unsuccessful attempt was made to prepare the vinylogous diazoketone IV from the monotosylhydrazone by treatment with base. This diazoketone was of interest because of the possibility of its enolizing to a derivative of diazocyclopentadiene V.



Microfilm \$2.50; Xerox \$3.00. 58 pages.

CHEMISTRY, PHARMACEUTICAL

SYNTHESIS AND INVESTIGATION OF THE
PHYSICAL PROPERTIES OF SOME
RELATED SULFONYLUREAS

(L. C. Card No. Mic 60-778)

Walter Morozowich, Ph.D.
The Ohio State University, 1959

The purpose of this research was to synthesize a series of closely related sulfonylureas and to study some of the physical properties of the compounds which may possibly be of use in elucidating the mechanism of action of the compounds. The synthesis of the urea moiety was accomplished in general by the reaction of either a sulfonylisocyanate or an alkylisocyanate with the appropriate amino compound. Attempts to prepare a phosphonylurea failed because of the instability of the compound. From a study of a series of ketosulfonamides, which are closely related to the sulfonylureas, it was shown that the sulfonylureas are capable of enolization. The pKa values of the sulfonylureas were shown to be directly dependent on the nature of the substituent on the phenyl ring. Dimerization was evidenced from a study of the infrared spectra and supported by freezing point depressions of the sulfonylureas. Infrared spectra clearly showed that the sodium and potassium derivatives of the sulfonylureas were enolized by the presence of the $-C=N-$ group. Frequency shifts of the SO_2 peaks indicated bonding with this group. A chelate structure employing the enol form of the sulfonylurea and bonding with the $-SO_2-$ group was postulated for the sodium and potassium derivative. The UV spectra of the compound N-p-tosyl-N'-butyl-O-methylisourea was very similar to the compound N-p-tosyl-N'-butylurea, which also indicated enolization. The thione peak of N-p-tosyl-N'-butyl-thiourea disappears in the presence of base, apparently as a result of enol formation. The substituents on the phenyl ring of the sulfonylureas were shown to be related to the position of the $\Delta\lambda$ max, if the $\Delta\sigma$ values were considered. Distribution studies showed that replacing the acidic hydrogen with a methyl group or the urea portion with a thiourea group greatly increased the partition coefficient of the compounds. The stability constants of N-p-tosyl-N'-butylurea with Cu^{++} , Zn^{++} and Co^{++} range between 3 and 4, which is comparable to that of zinc-insulin. Chelation has been previously shown to be a requisite of certain hyperglycemic agents. It is quite possible that chelation may be associated with the mechanism of action of the sulfonylureas.

Microfilm \$2.50; Xerox \$5.00. 99 pages.

CHEMISTRY, PHYSICAL

FORCE CONSTANT CALCULATIONS OF
BORANE ADDITION COMPOUNDS AND
A NORMAL COORDINATE TREATMENT
OF N-TRIMETHYL BORAZENE

(L. C. Card No. Mic 60-321)

Loren Allen Benson, Ph.D.
St. Louis University, 1959

Many studies have been made of the vibrational spectra of borane addition compounds, in an effort to explain bonding in this series of compounds. The Raman spectrum of tetrahydrothiophene borane (THTBH₃) was determined and the spectrum assigned. The Raman and infrared spectra of boron trifluoride tetrahydrothiophene was also determined. Frequencies were assigned wherever possible.

The calculation of force constants for borane adducts in general was investigated. Vibrational spectroscopists are reluctant to undertake normal coordinate treatments of molecules with large numbers of atoms or of molecules lacking in molecular symmetry. Unfortunately, the borane adducts satisfy both of these criteria. In an effort to circumvent the labor involved in calculations made on the basis of a complete treatment, the suitability of the BH_3X model, wherein the whole base group is presumed to be a point mass, was investigated. As a result of this study, it has been concluded that in a BH_3X treatment, in order to obtain any reasonable results in the A_1 species it is necessary to assume a potential energy function with an off-diagonal term connecting the BX stretch and the HBH bend force constants. Unless such a term is included, there exist no reasonable values for the diagonal force constants that will satisfy all the force constant equations simultaneously.

In order to solve the force constant equations when an off-diagonal term is included, a method of solution proposed by Torkington, whereby values of all off-diagonal terms may be obtained, was studied. The values calculated in such a study are not unique, since there exist more unknowns than knowns in the equations. The range of values available to the force constants, when an off-diagonal term is included, was then studied.

The results of such studies were compared with the results of the more complete treatments. The agreement with published results on the study of borine carbonyl was very reasonable. A comparison with the results of a complete treatment on trimethylamine borane showed some apparent disagreements. A closer investigation of this situation revealed that there exists more than one set of solutions to the force constant equations of trimethylamine borane. Using the second set of solutions, the results compare favorably.

Having obtained a method of solving the force constant equations using a proper potential energy, the correlation of force constants with expected orders of stabilities of borane adducts was studied. It has been found that the off-diagonal force constants may prove to be extremely important in explaining bonding in the borane addition compounds. In addition, the importance of the $BH-BH$ interaction force constant was investigated.

As a second part of this study, a normal coordinate treatment was made for N-trimethylborazene. The force constant equations have been listed in a form whereby they

may be used for various symmetrically substituted borazenes.

The vibrational spectrum of N-trimethyl borazene was assigned; however, lack of observed frequencies in the low region leads to some inconclusive assignments. The force constant equations were solved wherever the assignment was sufficiently good to warrant such a solution.

Microfilm \$2.50; Xerox \$8.00. 171 pages.

DISTRIBUTION OF SODIUM THIOCYANATE BETWEEN TRIBUTYL PHOSPHATE AND WATER

(L. C. Card No. Mic 59-6372)

William Richard Carroll, Ph.D.
University of Missouri, 1959

Supervisor: G. Myron Arcand

G. M. Arcand observed that tri-n-butyl phosphate (TBP) will extract sodium thiocyanate from aqueous solutions. The distribution coefficient increases with increasing concentration of the electrolyte in the aqueous phase.

At his suggestion, experiments were made to determine the effects of temperature change and of ionic strength on the distribution coefficient. It was determined that the coefficient decreases with increasing temperature.

A distribution constant of the form

$$K = (\text{NaSCN}_o) / \text{Na}_a^+ (\text{SCN}_a^-) (\bar{f}^{\pm}) (a)^n$$

was determined at 20°, 30°, and 40°C. In the expression for K , (NaSCN_o) is the concentration of ion-pairs in the TBP phase, (Na_a^+) and (SCN_a^-) represent the ion concentrations in the aqueous phase, \bar{f}^{\pm} is the aqueous mean activity coefficient of NaSCN, a is the activity of water in the aqueous phase and n is the hydration number of (NaSCN_o) . Values for ΔH (-8600 calories), ΔF (590 calories at 20°C, 900 calories at 30°C, and 1200 calories at 40°C), and ΔS (-31.5 cal. mol.⁻¹ deg.⁻¹), for the distribution were calculated from the data at various temperatures.

A dissociation constant of about 0.000083 at 30°C for (NaSCN_o) was determined by electrical conductivity measurements on TBP-H₂O solutions of NaSCN. A dissociation constant was also calculated from distribution data. Its value at 30°C is in good agreement with the more reliable one from conductivity data.

The addition of a common ion to the aqueous phase increases the distribution coefficient. The effect of constant ionic strength in the aqueous phase was not studied for systems in which neither ion of the salt used to control the ionic strength is extracted.

From the studies of the extraction of NaSCN by TBP from aqueous solutions of mixed electrolytes, a method of determining activity coefficients of electrolytes in solutions of mixtures of salts is suggested.

It is proposed that the species of sodium thiocyanate extracted by TBP is principally the n -hydrated NaSCN ion-pair where n is about 4.4 at 30°C and is only slightly temperature sensitive. Some dissociation of the ion-pairs occurs in the organic phase.

Microfilm \$2.50; Xerox \$4.80. 93 pages.

A QUANTUM MECHANICAL TREATMENT OF THE BH₃ MOLECULE

(L. C. Card No. Mic 60-326)

William Louis Clinton, Ph.D.
St. Louis University, 1959

In the past twenty years a tremendous theoretical interest has developed in the field of boron chemistry. Given impetus by the vast amount of experimental progress in this field, the theoretical chemist has attempted to apply current valence theory to boron compounds. A particular emphasis has been placed on the electronic structures of the boron hydrides.

The simplest boron hydride that could conceivably show a reasonable chemical stability, on the basis of classical valence theory, is the borane molecule (BH₃). There has, however, been no experimental evidence submitted that would definitely support even the transitory existence of BH₃. The theoretical interpretation of this apparent anomaly is one of the more important facets of this dissertation.

In order to fulfill this purpose, BH₃ is treated theoretically by the standard methods of quantum mechanics. The Hartree-Fock equations in their LCAO form have been solved using the technique developed by Roothaan, and the density matrix extension of this technique due to McWeeny. The solution of this problem resulted in the prediction of a possible bi-radical ground electronic state for BH₃.

A further result of the preceding is, that this bi-radical state must exhibit unequivalent B-H bonds, with respect to both length and electron density. More specifically, it has been shown that one of the B-H bonds is about 0.1Å longer than the other two. The preceding has led to a reasonable explanation of, not only the chemical instability of BH₃, but also the peculiar bridge structure of its stable dimer, B₂H₆.

The unequivalent B-H bonds in BH₃ are the consequences of a theorem due to H. A. Jahn and E. Teller. In applying this theorem to BH₃ another major facet of this dissertation was evolved. A new method of deriving the Jahn-Teller theorem has been developed. The approach is based on the Hellmann-Feynman theorem which allows one to discuss the Jahn-Teller effect from a force, rather than energetics, point of view. The latter leads to enhanced rigor and conceptual simplicity. Further, the results of the effect (e.g. nuclear displacements and energy level splitting) are more readily calculable. Methods of calculation are outlined and several simplified examples are given.

Microfilm \$2.50; Xerox \$5.20. 103 pages.

KINETICS OF THE DECOMPOSITION OF ORGANIC REACTOR COOLANTS

(L. C. Card No. Mic 60-315)

Don Richard de Halas, Ph.D.
Oregon State College, 1960

Major Professor: E. C. Gilbert

The kinetics of the decomposition of several polyphenyl compounds were investigated under the influence of pyrolysis and radiolysis. It was found that all of the polyphenyl compounds investigated polymerize according to a first order rate law under the single influence of reactor

radiation or gamma rays or pyrolysis. That is, the rate of polymerization was directly proportional to the amount of remaining unpolymerized material.

When the polyphenyl material was simultaneously undergoing radiolysis and pyrolysis, the situation was found to be more complex. At moderate temperatures, 200 C to 400 C, the pyrolysis of the polyphenyl was negligible compared to the radiolysis. However, in this temperature range the polymers formed by radiolysis were partially degraded by thermal action. The resulting rate law for polymerization includes a term for this back reaction. At higher temperatures, above about 400 C, the pyrolysis became the dominating reaction, and the effects of radiation could be neglected.

It was found that all of the compounds investigated polymerized at almost identical rates under irradiation. However, there were notable differences in pyrolytic polymerization rates between the various polyphenyl compounds. Because pyrolysis is much more important than radiolysis at high temperature, the thermal stability of the coolants is the factor which determines the maximum temperature at which the coolant can be utilized. The compounds in order of decreasing thermal stability are: biphenyl, all three terphenyl isomers, monomethylbiphenyl, and mono-isopropylbiphenyl.

These studies also brought out differences in the decomposition products formed by radiolysis and pyrolysis. In general, the products formed during the former process were polymerized to a greater degree than those formed by pyrolysis. The products formed by gamma ray and neutron radiolysis were quite similar but showed minor differences in composition.

The relative damaging power of neutrons and gamma rays was compared on the basis of the amount of polymerization caused by the absorption of a given amount of energy in the hydrocarbon. Fast neutrons were found to cause about 50 per cent to 200 per cent more damage than that caused by the absorption of an equal amount of gamma ray energy. Microfilm \$2.50; Xerox \$4.20. 79 pages.

COULOMETRIC TITRATIONS AND RELATED ELECTROCHEMICAL STUDIES

(L. C. Card No. Mic 59-5173)

A. James Fenton, Jr., Ph.D.
Princeton University, 1959

The titration of arsenious acid with ceric sulfate is the classical method for standardizing ceric solutions. No previous attempt has been made to determine arsenious acid with electrically generated ceric ion nor has a spectrophotometric procedure been used to detect endpoints in coulometric procedures involving electrically generated ceric ion. There is no interfering ultraviolet absorption by other components of the test solution at the analytical wavelength used. The results compare favorably with those obtained when arsenic is determined with other electrolytically generated reagents where amperometric, potentiometric or photometric means were used to detect the endpoint.

Extensive calibration of an integrating motor for use in coulometric titrations revealed that an empirical relation-

ship depending upon the value of the series resistance employed is related to the motor factor. Use of this relationship permits calculation of the motor factor at any value of series resistance with an accuracy of 0.1 to 0.2%. The only requirements are actual measurements of the motor factor at two resistance values.

The coulometric generation of ceric or ferrous ions from the same test solution offers numerous advantages in connection with oxidations or reductions requiring an excess of reagent followed by back titration. This system was used to determine the effect of current density on the efficiency of generation of ceric ion, as judged by the apparent accuracy of titrations of various amounts of electrically generated ferrous ion. Between one and 13 mA per square centimeter the apparent current efficiency is 99.7% in the generation of ceric ion. There is a gradual decrease in current efficiency above and below this range.

The ceric-ferrous dual intermediate system was used for determining small amounts of hydrogen peroxide. An amount of ceric ion known to be 50-100% in excess of the peroxide content of the test solution was generated. The solution was then carefully de-oxygenated and the excess ceric ion determined with electrically generated ferrous ion. Over the range 145 - 1310 μ g. hydrogen peroxide the average error was found to be less than 1%.

A thorough investigation was made of the products resulting from the electrolytic oxidation of manganous sulfate in various concentrations of sulfuric acid. The ultimate product when the acid concentration is greater than four normal was found to be manganic ion. The nature of the primary electrode reaction was shown to be dependent on the current density. At high current densities the primary product is permanganate. The generation of oxidizing power at high current density was found to be 96% efficient, although the generation of permanganate ion should proceed at 99.8-100% current efficiency.

Manganic ion is the primary product of electrolysis at low current density, but in the absence of phosphate ion decomposes into hydrated manganese dioxide at sulfuric acid concentrations lower than 10 normal. Throughout this investigation the total oxidizing power was determined by titration with electrically generated ferrous ion.

As an appendix presentation is made of data concerning the use of cerous ion as a reductant in alkaline media. Determination of ferricyanide, permanganate and glucose were used in the evaluation of this reagent. Potentiometric and amperometric methods were employed for endpoint detection. Microfilm \$2.50; Xerox \$5.60. 111 pages.

THE KINETICS OF THE PHOTOCHEMICAL EXCHANGE OF SUBSTITUTED AND UNSUBSTITUTED BENZYL IODIDES AND IODINE IN ETHYLENE CHLORIDE SOLUTIONS

(L. C. Card No. Mic 60-10)

Irwin Jerome Gardner, Ph.D.
Columbia University, 1959

The photochemical exchange reactions of unsubstituted benzyl iodide and its para-nitro and para-methyl derivatives with iodine have been studied in ethylene chloride solution at a wavelength of 546 m μ .

It has been established that the predominant path of exchange in the absence of oxygen proceeds by a radical chain mechanism involving the abstraction of an iodine atom from the benzyl iodide by a free iodine atom with the simultaneous formation of a benzyl radical. Benzyl radicals and iodine atoms can propagate the chain by reacting with iodine and benzyl iodide molecules respectively.

It has been shown that oxygen strongly inhibits the carbon radical exchange by reacting reversibly with benzyl radicals but it does not appear to affect iodine atoms. Therefore, by conducting the exchange reaction in the presence of a very large excess of oxygen compared to iodine it was possible to demonstrate that a significant fraction of the total exchange proceeded by the direct substitution mechanism.

Both paths of exchange were originally initiated by iodine atoms produced by the photochemical dissociation of iodine molecules. Chain initiation caused by the dissociation of the benzyl iodides into benzyl radicals and iodine atoms was insignificant.

In the absence of oxygen the rate of exchange of the benzyl iodides and iodine was three halves order in iodine and zero order in the benzyl iodide if the benzyl iodide was present in large excess. The rate of exchange became half order in iodine and first order in the benzyl iodide when the concentrations of the reactants were comparable in magnitude.

Comparison of the relative rates of exchange of the substituted and unsubstituted benzyl iodides revealed that an electron withdrawing substituent, such as the nitro group, in the para position markedly increased the rate of exchange. An electron supplying group such as methyl, in the same position, tended to decrease the exchange rate slightly. The relative reactivities indicated that the para-nitrobenzyl radical possessed greater energy of stabilization than either the benzyl or para-methylbenzyl radicals.

The rate of production of iodine resulting from the photochemical decomposition of the benzyl iodides in the presence of oxygen was also related to the nature of the para substituent present in the benzyl iodide. The para-nitrobenzyl iodide had the highest rate of decomposition and para-methylbenzyl iodide the lowest of the three iodides studied. The effects of the substituents on the rate of decomposition results were in general agreement with those of the exchange experiments.

From the experimental data at 30°C and from previous work it was possible to estimate a number of the rate constants for the individual steps in the degassed exchange of benzyl iodide and its para-nitro derivative with iodine.

These estimates are in satisfactory agreement with known data.

Microfilm \$2.50; Xerox \$5.40. 110 pages.

COPRECIPITATION FROM HOMOGENEOUS SOLUTION WITH SILVER CHLORIDE AS CARRIER

(L. C. Card No. Mic 58-7217)

Stanley Jerome Gedansky, Ph.D.
Syracuse University, 1958

Supervisor: Louis Gordon

This study was initiated in order to study the coprecipitation of bromide, zinc, and lead ions with silver chloride utilizing the technique of precipitation from homogeneous solution in an attempt to study the coprecipitation under closely controlled conditions. The principal system studied was that of silver chloride and silver bromide.

Two procedures were developed to effect the precipitation of silver chloride from homogeneous solution by anion release and by cation release. In the first of these procedures, chloracetic acid was slowly hydrolyzed at 45°C, in an acid solution containing silver ion. The physical appearance of the silver chloride precipitate thus formed was very similar to that obtained by conventional precipitation procedures. However, by carrying out the precipitation process slowly by this means, an analytical study could be made of the coprecipitation of both lead and zinc with silver chloride.

The second procedure involved the slow release of silver ion from a silver-ammonia complex. The release was achieved by the slow hydrolysis of a water soluble ester, ethylene diacetate. The hydrolysis products of this ester reacted with the ammonia and resulted in a lowered pH in the solution. The silver ion, thus released, combined with chloride ion in solution to form crystals of silver chloride. The crystals formed in this latter method were large, dense and well defined cubic crystals which varied in size from 20 to 300 microns. This precipitation technique was used to study the coprecipitation of bromide with silver chloride.

Analyses for the coprecipitated materials were effected by the use of radioactive tracers and standard radiometric measuring techniques. The application of gamma-ray spectrometry in coprecipitation studies was investigated. For this purpose, the gamma-ray spectra of silver-110, zinc-65, bromine-82, and lead-210 were obtained.

An indirect photometric titration procedure was developed for silver analyses. This titration utilizes a new differential null-point method of end point detection and is applicable to the determination of 0.1 to 10 mg. of silver.

The study of bromide coprecipitation is the first example of a distribution study, performed with the technique of precipitation from homogeneous solution, which involved the coprecipitation of anions.

The results of the study of the coprecipitation of bromide with silver chloride have indicated a logarithmic distribution of bromide with silver chloride. The effects of bromide concentration and of temperature on the distribution coefficient were studied. As the bromide concentration was increased, the values of the distribution coefficients also increased. A rise in temperature decreased the value of the distribution coefficients. It was also noted that a change in either bromide concentration or temperature resulted in a change in the rate of precipitation, and a change in the rate of precipitation had been previously shown to affect the values of the distribution coefficients.

The study of the coprecipitation of Pb and Zn with silver chloride has indicated very minor degrees of coprecipitation. The coprecipitation of lead in the method employing the technique of precipitation from homogeneous solution was essentially negligible. However, considerable coprecipitation of lead was observed using conventional precipitation techniques. This points up the usefulness of precipitation from homogeneous solution as a tool for the separation of lead from silver. The degree of coprecipitation of zinc with silver chloride was unaffected by the method of precipitation.

Microfilm \$2.50; Xerox \$8.60. 188 pages.

THE CATALYTIC HYDROGENATION OF DIMETHYLACETYLENE IN THE VAPOR PHASE

(L. C. Card No. Mic 60-434)

William Marshall Hamilton, Ph.D.
Northwestern University, 1959

Supervisor: Dr. Robert L. Burwell, Jr.

An investigation of the hydrogenation of dimethylacetylene on a palladium-alumina and a palladium film catalyst is reported. The reaction was studied in a flow reactor in which the hydrocarbon was evaporated into a stream of hydrogen, the feed being led to the catalyst chamber. Reaction temperatures were varied between 0 and 60°C.

Once the catalyst came to a steady state, initial hydrogenation led almost exclusively to *cis*-2-butene. As long as any unreacted dimethylacetylene was present, the *cis*-2-butene did not react further. As soon as all of the acetylene had reacted, the *cis*-2-butene hydrogenated to butane and isomerized to *trans*-2-butene and 1-butene. For the palladium-alumina catalyst at 20°, the three olefins were substantially in equilibrium beyond the point at which 1.7 moles of hydrogen were added per mole of dimethylacetylene. The rate constant for isomerization of *cis*-2-butene was about 2.6 times that for hydrogenation. At 0°, the ratio of the two rate constants was about the same, but at 60° it was much larger. At this latter temperature, the three olefins reached equilibrium by the time that 1.1 moles of hydrogen were added to the triple bond. At 20°, the film catalyst behaved similarly to the supported catalyst.

The phenomenon of simultaneous isomerization and hydrogenation was also observed if one began the hydrogenation with a pure olefin, such as 1-pentene. The initial isomerization of the compound produced *cis*- and *trans*-2-pentene in a proportion very near that of equilibrium.

At the beginning of a run, the selectivity and stereospecificity of both catalysts towards dimethylacetylene hydrogenation was usually less. Butane and *trans*-2-butene appeared before all the acetylene had reacted. The cause of this non-steady state was not determined.

In the steady state, a change in the initial hydrogen to acetylene ratio did not affect the product distribution unless a deficiency of hydrogen with respect to unsaturate was present. However, the addition of certain inhibitors changed the amount of isomerization relative to hydrogenation. Diethyl ether caused a relative increase in isomerization. Dimethyl sulfide did also, but it was such an effec-

tive poison for olefin hydrogenation that no butane was observed even when fifty times the normal amount of palladium was used.

The results of the data observed are discussed in light of conventional hydrogenation mechanisms.

Microfilm \$2.50; Xerox \$5.80. 116 pages.

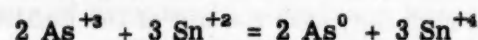
THE ROLE OF MERCURY IN THE CATALYSIS OF THE BETTENDORFF REACTION

(L. C. Card No. Mic 60-573)

William Joseph Hayles, Ph.D.
Iowa State University of Science and Technology, 1959

Supervisor: W. Bernard King

In order to determine the catalytic effect of mercury in the Bettendorff Reaction



the non-catalyzed reaction had to be studied first. The data fits quite well the rate equation

$$-d(\text{Sn}^{+2})/dt = k_1(\text{Sn}^{+2})(\text{As}^{+3}) + k_2(\text{Sn}^{+2})(\text{As}^{+3})(\text{As}^0) \quad (1)$$

indicating the reaction is auto-catalytic. In addition, it was found that there exists an induction period the duration of which is affected unequally by Sn^{+2} and As^{+3} , the period being shortened much more by an increase in the concentration of As^{+3} than a similar increase in the concentration of Sn^{+2} .

It was found that the mercury catalyzed reaction is well described by the equation

$$-d(\text{Sn}^{+2})/dt = k_1(\text{Sn}^{+2})(\text{As}^{+3}) + k_2(\text{Sn}^{+2})(\text{As}^{+3})(\text{As}^0) + k_3(\text{Sn}^{+2})(\text{As}^{+3})(\text{Hg})^{2/3} + k_4(\text{Sn}^{+2})(\text{As}^{+3})(\text{As}^0)(\text{Hg}) \quad (2)$$

A temperature variation study allowed the calculation of the Arrhenius' activation energies corresponding to the first three terms in equation (2). They are:

$$E_{a1} = 9,500 \pm 800 \text{ cal./mole}$$

$$E_{a2} = 8,900 \pm 600 \text{ cal./mole}$$

$$E_{a3} = 9,100 \pm 900 \text{ cal./mole}$$

Because of the nature of the calculation and the errors involved therein, E_{a4} could not be evaluated.

A chloride ion variation study indicated that the reaction is catalyzed by chloride at low chloride ion concentrations (<1M) but inhibited by chloride at higher chloride ion concentrations. A hydrogen ion variation study indicated that the reaction is catalyzed by hydrogen ion at all concentrations and that the reaction rate approaches zero as the hydrogen ion concentration approaches zero.

A gross mechanism is outlined for each term in equation (2) and it is suggested that the role of the catalysts involves a change in the entropy of activation. It is also suggested that the active catalyst is Hg^0 , in one case in particulate form and in the other adsorbed on the As^0 surface.

The rate constants at 25°C. with $(\text{H}^+) = (\text{Cl}^-) = 7\text{M}$ are:

$k_1 = 0.150 \text{ liter-mole}^{-1}\text{-min.}^{-1}$; $k_2 = 2.85 \text{ liter}^2\text{-mole}^{-2}\text{-min.}^{-1}$; $k_3 = 974 \text{ liter}^{5/3}\text{-mole}^{-5/3}\text{-min.}^{-1}$; $k_4 = 1.06 \times 10^6 \text{ liter}^3\text{-mole}^{-3}\text{-min.}^{-1}$. The empirically evaluated error in k_1 and k_3 is $\pm 7\%$, and for k_2 and k_4 it is $\pm 5\%$.

Work that will be done on the system in the future is outlined. Microfilm \$2.50; Xerox \$4.00. 73 pages.

THE PHOTOCHEMICAL REDUCTION OF AERATED FERRIC SULFATE SOLUTIONS

(L. C. Card No. Mic 60-499)

Chonon Heller, Ph.D.
New York University, 1957

Adviser: Seymour Z. Lewin

A study of the photochemical reduction of aerated ferric sulfate solutions in the micromolar region of concentrations was carried out, with the aid of the unfiltered radiation of a mercury arc, in 0.78N, 0.36N, and 0.10N H_2SO_4 .

In order to gain insight into the reduction mechanism, the irradiations and analyses of the solutions were carried out simultaneously and continuously. This was accomplished by means of a specially constructed continuous flow system, in which the solution was irradiated in one part and simultaneously analysed in another. Quantitative spectrophotometric analysis of the ferric ion concentration was performed in a 50 centimeter absorption cell, which was part of the flow system, utilizing the absorption band of ferric sulfate at 325 millimicrons.

A new method, circumventing the need for a cell-in, cell-out technique, was devised and used to correct for any fluctuations in the tungsten source output and the amplification circuitry of the spectrophotometer. By choosing a particular slit opening S , one obtains 100% transmission through the solution at 430 millimicrons, a wavelength at which none of the species in solution absorb detectably. A fluctuation in energy output manifests itself by necessitating a different slit opening to maintain 100% transmission at 430 millimicrons. Such fluctuations are then compensated for by means of a variable resistor which controls the output of the tungsten lamp.

It was shown in the present research that the initial photoreduction rates vary with the concentration of the H_2SO_4 in a similar manner to the variation of the concentration of a ferric sulfate complex ion. It is, therefore, concluded that this species is involved in the primary photoreduction in aerated ferric sulfate solutions.

The photoreduction leads to the establishment of a steady state, in which the ferric ion and ferrous ion concentrations remain constant with time. This steady state was obtained from both directions, i.e., starting with a ferric solution, or a ferrous solution, or a mixture of both ions.

In addition, a minimum ferric ion concentration was observed in the reduction of fresh, unirradiated solutions heading for the steady state. It was not found in the reduction path of once-irradiated solutions, although they, too, reached the same steady state. This phenomenon is attributed to the catalysis of the photoreduction of a fresh ferric sulfate solution by the incipient microheterogeneity of the solution. Since the microheterogeneity of the solu-

tion is destroyed by ultraviolet radiation, the reduction of a once-irradiated solution is no longer catalyzed and, therefore, no minimum occurs in its reduction path.

The steady-state concentrations were shown to be dependent on the initial ferric ion concentration: the absolute reduction achieved increases with initial ferric ion concentration, but the percent reduction decreases. It is believed that this fact, plus the phenomenon of post-irradiation "dark" reoxidation of ferrous ions by OH and H_2O_2 , explain why some investigators, who had used more concentrated solutions and/or non-continuous measurements, did not observe measurable reduction.

The steady state was also found to be dependent on the H_2SO_4 concentration: the ferric to ferrous ratio decreases with increasing pH. A mechanism which utilizes the reactions of the HO_2 species present in aerated irradiated solutions is proposed. Via this mechanism it is shown that the oxidizing acid HO_2 and its conjugate reducing base O_2^- may control the oxidation and reduction rates and, hence, the steady-state concentrations.

Microfilm \$2.50; Xerox \$6.20. 127 pages.

DIELECTRIC DISPERSION IN DILUTE CELLULOSE ACETATE SOLUTIONS

(L. C. Card No. Mic 60-624)

William Leslie Hunter, Ph.D.
Virginia Polytechnic Institute, 1960

Previous investigations have revealed that some polymer solutions exhibit dielectric dispersion (variation of the dielectric constant with frequency) which is apparently related in some way to the molecular weight of the polymer (1) (2) (3). One of these investigations (1) was carried out on solutions of cellulose acetate in dioxane. It was found that the change in dielectric constant was so small that rather concentrated solutions had to be used in order to obtain reproducible results. The possibility of intermolecular interactions in concentrated solutions made dilute solution measurements desirable. Consequently, the object of the present investigation was to carry out such measurements with sufficient precision to define the shape of the dielectric dispersion curve over the necessary frequency range.

The fundamental difficulty was that the change in dielectric constant of a solution containing less than 1% cellulose acetate was only about one part in five hundred or less in a frequency range of about three decades. The course of such a small change is difficult to detect over such a wide band of frequencies. Capacitance bridges, which are very good for making measurements at a single frequency, particularly in the range of frequencies under investigation, were commercially available. However, bridges have certain inherent disadvantages which make difficult the coverage of such a wide band of frequencies with the necessary precision. The use of ordinary resonance methods was desirable, but they are limited by the practical sizes of the components to frequencies well above the lowest frequencies which were expected to be encountered. As a result of these limitations, a modified resonance procedure was adopted. A resistance-capacitance oscillator was substituted for the more conventional inductance-capacitance

circuits. Null indications were obtained by substituting a frequency counting system of great precision for the "zero beat" method.

It had been found earlier that the critical frequency was related to the weight average molecular weight of the polymer sample, the critical frequency being defined as the frequency at which the dispersion was 0.5. Based on this it seemed reasonable to assume that the dielectric dispersion curve might be related in some way to the molecular weight distribution curve in the case of a polydisperse sample. An attempt was thus made to obtain the dielectric dispersion curve in as much detail as possible, since this served the two-fold purpose of permitting conclusions to be drawn concerning the validity of the molecular weight relationship in dilute solutions and giving an indication of any influence of the molecular weight distribution on the dielectric dispersion.

Apparatus was developed which gave a precision of 0.01 uuf in a total of about 250 uuf. This provided the means of measurement. Measurements were made on several fractions and three artificial blends.

The results of measurements on fractions indicated that the form of the critical frequency-molecular weight relationship determined earlier (1) was correct. The dispersion curves obtained for the three blends of varying width indicated that the slope of the dispersion curve at the critical frequency decreased as the width of the blend was increased. This was the only indication of an influence of the width of the distribution on the dispersion curve. It was noted, however, that the slopes of the dispersion curves for the fractions were less than those for the narrowest blend in several cases. The most reasonable explanation of this observation seems to be that the fractions and blends have much wider distributions than was believed. It is also possible that chain flexibility might be a complicating factor.

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- Microfilm \$2.50; Xerox \$7.40. 159 pages.

IONIC ASSOCIATION AND COMMON ION EFFECT IN MOLTEN SALT SOLUTIONS

(L. C. Card No. Mic 60-279)

Raymond E. Isbell, Ph.D.
University of Alabama, 1959

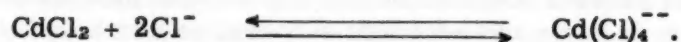
Cryoscopic determinations have been made on several simple salts in molten lithium nitrate, potassium thiocyanate, and sodium dichromate. The freezing point depression was plotted as a function of the concentration. The slopes of these curves are the molal freezing point depression constant of the familiar Raoult-Van't Hoff law

$$\Delta T = K_f m$$

where ΔT is the depression of the freezing point, K_f the freezing point constant, and m the molality of the solute. The depression constants were determined to be 6.3°, 12.5°, and 25.1° for lithium nitrate, potassium thiocyanate, and sodium dichromate respectively.

The heats of fusion were calculated from the experimental value of K_f to be 87.5 and 31.2 calories per gram for lithium nitrate and sodium dichromate respectively. No consistent results could be calculated for the heat of fusion of potassium thiocyanate.

A study was made of the ionic association and common ion effect in the molten solvents. In each case an anion common to the solute was added as the common ion and also as a driving force for any complex formation. For instance, sodium chloride was added to molten sodium dichromate as the common ion. After this compound was added, a compound, for example cadmium chloride, containing a cation suspected of being capable of forming complex with the chloride was added. At low concentrations of the common ion the only effect was a decrease in the ionization of cadmium chloride. However, at greater concentrations of sodium chloride there was a tendency to form a chloro-cadmium complex. This was shown by a rise in the freezing point of the solution on addition of the cadmium chloride due to the reaction of complex formation



The reason for the rise in freezing is readily understood if one examines the equation above and realizes that for each molecule of cadmium chloride added two chloride ions that were already present are removed giving an over-all effect of decreasing the number of particles available in the solution by one for each molecule of cadmium chloride added.

After derivation of suitable equations, it was possible in most cases to calculate an ionization constant or a stability constant for most solutes added to the solvents.

Microfilm \$2.50; Xerox \$7.40. 159 pages.

STUDIES CONCERNING CHEMICAL WARFARE AGENTS: PART A. THE THERMODYNAMIC ACTIVITY OF SARIN IN SOLUTION. PART B. EXPLORATORY INVESTIGATION OF THE EFFECTS OF SOLVENTS ON SKIN LIPIDS AND SKIN PENETRATION.

(L. C. Card No. Mic 60-808)

Arlyn Walter Kinkel, Ph.D.
The University of Wisconsin, 1958

Supervisor: Professor Takeru Higuchi

These studies were concerned with factors which may influence the rate and mechanism of penetration of skin by sarin. In the first the thermodynamic behavior of the agents were determined in a variety of solvents. In the second the influence of solvents on viscosity of skin lipids and on erosion of skin lipid barriers was investigated.

The thermodynamic activity of sarin was determined by measurement of its partial vapour pressure in equilibrium with the solution by the gas saturation method. The

method was developed with particular emphasis on the saturator and trap unit which were designed to insure equilibrium with a minimum of precautions. The dry gas was bubbled through the solution by means of a jet pump unit insuring equilibrium as the gas passes out of the saturator chamber over a column of wetted glass helices into a trap where the vapours were stripped from the inert gas. The partial vapour pressure and subsequently the thermodynamic activity was calculated after the concentration of sarin in the trap was determined. The whole apparatus was so constructed that the partial vapour pressure of a small volume of solution could be easily measured.

The results show that compounds such as tri-*n*-f-butylamine, hexadecane and tri-*n*-butylamine form a two phase system with sarin in dilute solution. Compounds such as *m*-cresol, salicylic acid, pentachloroethane, benzyl alcohol, ethyl lactate and methyl hydroxybutanone decreased the thermodynamic activity of sarin below that predicted by Raoult's law. The thermodynamic activity of sarin with compounds such as water, tetralin, dibutyl phthalate diisooctyl adipate, diethylene glycol, isoamyl alcohol, butyrolactone, *N*-methylformamide, *N*-methylacetamide, 2-pyrrolidone, 2-butanone oxime, carbon tetrachloride and methyl salicylate showed positive deviation from Raoult's law.

The general conclusions are that the thermodynamic activity of sarin and hence its evaporative loss may be decreased by intermolecular hydrogen bonding. Factors which are shown to affect these interactions are the strength of the hydrogen bond, steric factors, secondary interactions and the influence of intramolecular hydrogen bonds. High molecular weight fluorocarbons and hydrocarbons which form a two phase system with sarin may be used as a barrier to decrease evaporative loss.

For the second half of these studies an investigation of the effect of solvents on a simulated skin lipid barrier and the viscosity of skin lipids was undertaken to elucidate means by which penetration may be facilitated. The rate of erosion of skin lipid barriers by various solvents was studied by observing the color transfer through an artificial barrier. The barrier consisted of a sintered glass disc filled with skin lipids. The viscosities of skin lipid-solvent systems were determined over the complete range of concentration and the temperature dependence was determined from 25° C. to 45° C. A reversible capillary viscometer of the Zhukov type was modified and used to determine the viscosity of the skin lipid solutions.

The results indicate that the solubility and solvent viscosity influence the rate of erosion of a skin lipid barrier. The viscosity of the pure skin lipids showed a considerable variation. This appeared to be seasonal, the higher viscosity lipids being collected in the winter months. The viscosity data of lanolin solutions are also presented for possible comparison.

Microfilm \$2.50; Xerox \$5.60. 111 pages.

SOLUBILITY OF MERCURY IN ORGANIC LIQUIDS

(L. C. Card No. Mic 60-577)

Edwin Henry Klehr, Ph.D.

Iowa State University of Science and Technology, 1959

Supervisor: Adolf F. Voigt

Radiotracer techniques were used to measure the solubility of free mercury at 25°C. in benzene, toluene, chlorobenzene, bromobenzene, nitrobenzene, carbon tetrachloride, isooctane and *n*-decane; and the variation of solubility with temperature for toluene, chlorobenzene, and *n*-decane.

Solubility measurements were made by a direct measurement of the specific activity of the solution in question. The technique had previously been standardized by a determination of the counting rate of a known quantity of mercury. A second method inferred the solubility of free mercury from studies of the distribution of mercury between an organic liquid and a dilute nitric acid solution. Distribution coefficients and the known solubility of mercury in dilute nitric acid (3×10^{-7} gram-atoms/liter) were used to calculate the solubility of mercury in the organic phase. The two methods of measurement gave comparable results.

Analyses were made by G-M counting of solid samples, and by scintillation counting of liquid samples.

Solubilities were found to be of the order of 10^{-8} to 10^{-5} gram-atoms/liter for all cases studied. Heats of mixing, obtained from plots of logarithm of mole fraction of dissolved mercury vs. reciprocal temperature, were found to be 8.00, 9.55 and 9.15 kcal/mole for *n*-decane, toluene and chlorobenzene, respectively. Entropies of solution, obtained from plots of logarithm of mole fraction of dissolved mercury vs. logarithm of absolute temperature, were found to be 41.2, 48.8 and 38.8 e.u. Henry's Law was assumed in the calculation of the above quantities, and in the calculation of solubilities from distribution coefficient measurements.

A correlation of the experimental data with the Hildebrand-Scott "solubility parameter" theory was attempted. The theory was found to predict solubilities in most cases only to within an order of magnitude of those actually measured. A predicted variation of solubility with temperature was calculated from the theory and compared with experimental results. Various modifications of the original theory such as corrections for unequal volume sizes, nonzero volume change of mixing, unequal ionization potentials and differences in the equilibrium distances between like molecules are discussed; and an attempt is made to evaluate their usefulness in interpreting the results obtained in the present study on mercury solubilities. The correction for unequal equilibrium distances between like molecules was found to be most meaningful in the present study, although it actually amounted to an over-correction in some cases. Some analogies are drawn between mercury solubilities and the so called "anomalous" hydrocarbon-fluorocarbon mixtures. In general, the mercury-organic liquid mixtures studied, and hydrocarbon-fluorocarbon mixtures exhibit the same type of deviations from the simple Hildebrand-Scott theory.

Microfilm \$2.50; Xerox \$4.00. 75 pages.

KINETICS OF REACTIONS INVOLVING
BROMATE IN FUSED ALKALI NITRATES

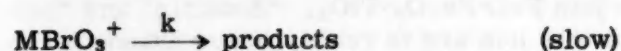
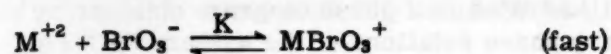
(L. C. Card No. Mic 60-579)

Walter William Lawrence, Jr., Ph.D.

Iowa State University of Science and Technology, 1959

Supervisor: Frederick R. Duke

The mechanism of the decomposition of bromate, when it is reacting with divalent transition metals in fused alkali nitrate solvents, has been shown to involve a fast equilibrium followed by a slow rate controlling step, giving the metal oxide, oxygen, and bromine as final products:



$$\text{rate} = kK(M^{+2})(BrO_3^-)/1 + K(M^{+2})$$

In this respect the divalent ions of zinc, nickel, copper and cobalt have been studied in the range 180-290°C. It was found that zinc and nickel displayed the same reactivity, while copper was more active than these by a factor of 50 and cobalt by a factor of 800. This was interpreted as a catalysis by the unpaired, paramagnetic electrons in the activated complex, possibly leading to a triplet state which may be favorable for dissociation of the complex into the metal oxide and an unstable bromine oxide. It was assumed that nickel has its d-orbital electrons paired up in the nitrate solvent. Kinetic and complexing constants were evaluated for the four metal ions studied. Activation energies were also determined. It was found that lead, mercury, cadmium, silver and the rare earths are inactive in this reaction, while bismuth and manganese also seem to be active.

The addition of bromide was found to accelerate this reaction in low concentration and retard it at high concentration. This was interpreted on the basis of the following rate law, involving metal-bromide and metal-bromate-bromide complexes:

$$\text{rate} = \frac{kK(M^{+2})_t (BrO_3^-) [1 + c_1(Br^-) + c_2(Br^-)^2]}{1 + k_{01}(Br^-) + k_{01}k_{12}(Br^-)^2 + k_{01}k_{12}k_{23}(Br^-)^3 + K(M^{+2})_t}$$

The rate and equilibrium constants were evaluated for this reaction involving zinc (II) at 250°C.

In studies on solvent behavior, it was found that variation of the alkali cation had little effect but that a change from nitrate to perchlorate resulted in a completely different reaction in which chloride and bromine were products. Microfilm \$2.50; Xerox \$3.80. 68 pages.

CORRELATION OF ELECTRONIC ABSORPTION
SPECTRA AND STRUCTURE OF POLYENES
USING A DELTA FUNCTION MODEL

(L. C. Card No. Mic 60-442)

Frances Elbridge Leland, Ph.D.

Northwestern University, 1959

Supervisor: Arthur A. Frost

Within the limited framework of the one-electron, pi electron approximations, simple methods are considered for the correlation of the absorption wavelength corresponding to the lowest electronic transition in polyenes with the number of conjugated double bonds. Existing methods such as the simple molecular orbital method and the free electron model and the predictions which they give about absorption wavelength and alternation of bond length are discussed; predictions obtained by the use of an oscillator model and by representative empirical equations are also given. In the theoretical cases, alternation of the periodicity of the potential, reflected by a corresponding alternation of bond lengths, leads to convergence of the wavelength series.

An extension of the free electron model is developed and is used to study the polyenes. In this model, an attractive delta function is inserted into the potential at each position corresponding to an atom. Bound states are thereby obtained, and the ionization energy is a meaningful quantity, which is to be contrasted with the simple free electron result. The influence of the length of the one-dimensional box on the energy levels is considered for the atomic and diatomic cases; for the atom, this corresponds to radial compression of the 1s state.

Application of this model to a consideration of the lowest excitation energies and ionization potentials of the polyenes is then made. It is found that convergence of the absorption wavelength series for large N, the number of conjugated double bonds, can be obtained if alternation of bond lengths is assumed; conversely, convergence indicates alternation of bond lengths. Numerical results determined by the model are reasonable, but do not correspond directly to those expected. Discrepancies arising when comparing calculated and observed data can be traced in large part to the short-range effectiveness of the delta function type of potential, since it leads to less interaction between particles than is actually the case. The results obtained by this model do provide, however, an instructive example of the use of simple models and methods for describing electronic behavior in relatively complicated molecules. Further, the qualitative nature of the results obtained is in agreement with experiment and with those obtained by modifications of more well-known methods, thus demonstrating again that simple models can be useful in the consideration of electronic properties of molecules. Microfilm \$2.50; Xerox \$4.20. 76 pages.

KINETIC STUDIES ON THE GAS-PHASE DECOMPOSITION OF TRIMETHYLBORANE

(L. C. Card No. Mic 60-765)

Joseph Arlan Lovinger, Ph.D.
The Ohio State University, 1959

The first part of the investigation was an attempt to determine the kinetic bond energy for the decomposition of trimethylborane by use of the "toluene carrier" technique. The experiments showed, however, that in the pyrolysis of trimethylborane some material is formed on the walls of the reactor which catalyzes the decomposition of toluene.

The second part of the investigation was a study of the decomposition of trimethylborane in a static system in the temperature range of 468° to 508°C and initial pressures of 41 to 102 mm. The experiments were carried out by introducing a measured amount of trimethylborane into the quartz reaction flask in the furnace, following the pressure change for measured time intervals, and removing the gaseous contents for analysis. The products found were hydrogen, methane, ethylene, and ethane; these, together with unreacted trimethylborane, accounted for all the gaseous material.

The rate of decomposition of trimethylborane is autocatalytic; it shows an initial acceleration, a period of steady rate, and then a slight falling-off. The steady rate, R_m , has a zero time order, but is first order with respect to the initial concentration of trimethylborane. The rate law for the steady state is

$$\frac{R_m}{n_i} = 1 \times 10^{11} \left(\exp. - \frac{53,100}{RT} \right) \text{ sec.}^{-1}$$

where R_m is in moles per second and n_i is the initial number of moles of trimethylborane.

At the low pressure (41 mm), the ratio of the hydrogen being formed to the trimethylborane decomposing is one in the early part of the reaction; at the higher pressures the ratio is less than one. At all pressures, near the end of the reaction, the ratio is below 0.3.

At all pressures, the ratio of the methane being formed to the trimethylborane decomposing is 0.5 initially and the ratio rapidly increases as the reaction proceeds, so that near the end of the reaction the ratio is nearly 2.

Ethylene is formed early in the reaction and shows a maximum in its concentration during the reaction. Ethane, however, is not found until late in the reaction and is formed in only small amounts.

Experiments in a packed vessel indicate that the surface has no effect on the rate of reaction or on the products.

Experiments with added azomethane show that if there are any free radical chain reactions involving methyl radicals or radicals formed by the reaction of methyl radicals and trimethylborane, the chain lengths are very short (no more than 3), although the data can also be interpreted as showing no chain character.

No mechanism has been found which satisfactorily explains the results.

Microfilm \$2.50; Xerox \$7.20. 155 pages.

PHASE EQUILIBRIA IN THE SYSTEM IRON OXIDE-TITANIA-SILICA

(L. C. Card No. Mic 59-6786)

John B. Mac Chesney, Ph.D.
The Pennsylvania State University, 1959

Phase equilibria in the system iron oxide-TiO₂ in air have been investigated in the liquidus temperature region and at temperatures extending into the subsolidus region. Stability relations among the phases spinel solid solution (FeO·Fe₂O₃-2FeO·TiO₂), hematite-ilmenite solid solution (Fe₂O₃-FeO·TiO₂), pseudobrookite solid solution (Fe₂O₃·TiO₂-FeO·2TiO₂), rutile solid solution, liquid and gas are illustrated in a phase diagram obtained by projecting ternary phase relations of the system FeO-Fe₂O₃-TiO₂ onto the join FeO·Fe₂O₃-TiO₂. "Eutectic" and "peritectic" points on this join are in reality intersections between the 0.21 atm. oxygen isobar and univariant lines in the ternary system FeO·Fe₂O₃-TiO₂. Most noteworthy among the subsolidus relations is the marked stabilization of the hexagonal structure of hematite relative to the spinel structure of magnetite as TiO₂ is added to iron oxide.

Phase relations on the liquidus surface of the system iron oxide-TiO₂-SiO₂ have been studied in air. The stable existence of the phases magnetite(ss), hematite(ss), pseudobrookite(ss), rutile(ss), as well as the silica polymorphs tridymite and cristobalite has been established. Three "eutectic" points, analogous to the situation in the system iron oxide-TiO₂, are formed by the intersection of the univariant line of the system Fe-Ti-Si-O and the 0.21 atm. isobaric surface. The liquid miscibility gap exhibited by the bounding binary systems FeO-SiO₂ and TiO₂-SiO₂ was found to extend across the composition triangle representing the ternary system. Liquidus temperatures decrease from 1560°C (FeO-SiO₂) and 1730°C (TiO₂-SiO₂) to 1535°C along the cristobalite-rutile(ss) boundary curve which bisects the two-liquid region.

Paths of equilibrium crystallization can be discussed in terms of the tetrahedron representing the system FeO-Fe₂O₃-TiO₂-SiO₂. Liquid composition points fix an irregularly curved surface, the 0.21 atm. oxygen isobaric surface, through the tetrahedron. Compositions of iron-titanium oxide phases are represented along their respective solid-solution joins in the system FeO-Fe₂O₃-TiO₂, while the composition of the silica polymorphs is represented by the SiO₂ apex of the tetrahedron. Total compositions very along "oxygen reaction lines", line of equal Fe/Ti/Si ratio which radiate from the oxygen apex of the tetrahedron representing the system Fe-Ti-Si-O. A more precise description of compositional changes taking place in liquids during equilibrium crystallization can be obtained from fractionation curves, which are derived from the liquidus phase relations.

As in the two systems described above, phase equilibria in the system designated FeO-TiO₂ were determined by heating samples in an atmosphere of defined oxygen partial pressure. In this case, iron crucibles and a nitrogen atmosphere or an iron/wüstite "buffer" sealed in vitreous-silica tubes were employed to maintain the oxygen partial pressure at that determined by the reaction between iron and oxygen to form wüstite. Compositions of samples prepared under these conditions were found to deviate somewhat from those of the join FeO-TiO₂. Samples of high iron content contained excess Fe³⁺, up to the

equivalent of 22 wt. % Fe_2O_3 . Trivalent titanium, in concentrations ranging up to 20 wt. % Ti_2O_3 , have been observed in samples of high TiO_2 content.

In addition to the phases mentioned in the previous paragraph, globules of metallic iron were observed in all samples of this investigation. Consideration of the phase rule dictates that metallic iron cannot be an equilibrium phase. One explanation of the phenomenon proposes that metallic iron is incorporated into the sample from the crucible. This reaction, being more rapid than the exchange of oxygen between the sample and the "buffer" through the gas phase, results in the precipitation of an amount of metallic iron equivalent to that incorporated from the crucible.

Microfilm \$2.50; Xerox \$6.60. 136 pages.

THE INFRARED SPECTRUM OF CYANATE ION IN DIFFERENT ENVIRONMENTS

(L. C. Card No. Mic 60-318)

Arthur George Maki, Jr., Ph.D.
Oregon State College, 1960

Major Professor: J. C. Decius

The infrared absorption spectrum of the cyanate ion was studied in a number of different crystal habits. In addition to the crystalline solids sodium cyanate and potassium cyanate, the cyanate ion was also studied in the crystals NaCl , KCl , KBr , and KI where the cyanate ion had been substituted for the normal negative ion. A complete force constant treatment including calculation of anharmonicity constants and interpretation of a strong Fermi resonance similar to that in CO_2 has been made for KBr and KI host crystals. This has shown that both the force constants and anharmonicity constants are of the same order of magnitude as those found for the other isoelectronic molecules CO_2 and N_2O . In addition it was shown that the crystal structure has an important effect upon the force constants. In the case of potassium cyanate the crystal structure has been found to remove the degeneracy of the bending vibration.

In the course of this work it has been found that the technique of substituting foreign ions in alkali halide crystals leads to a great sharpening of infrared absorption bands due to the isolation of these ions from similar ions. This isolation prevents various interactions which normally tend to broaden the absorption bands.

Microfilm \$2.50; Xerox \$7.40. 157 pages.

A STUDY OF THE KINETICS OF THE HYDROLYSIS OF BENZENESULFONYL CHLORIDE AND PYRIDINE 3-SULFONYL CHLORIDE IN DIOXANE-WATER SOLUTION

(L. C. Card No. Mic 60-680)

Eugene Christopher Martin, Ph.D.
University of Kentucky, 1954

Supervisor: William K. Plucknett

A survey of the literature showed that the rates of hydrolysis of benzenesulfonyl chloride and substituted benzenesulfonyl chlorides have been determined by means of conductometric (1) and chemical analysis (2) in acetone-water solution at various temperatures. The purpose of this project was to determine the factors affecting the rates of hydrolysis of benzenesulfonyl chloride and pyridine 3-sulfonyl chloride in dioxane-water solution. The effect of ionic strength, dielectric constant, temperature and water concentration was investigated in an attempt to elucidate the mechanism.

Evidence has been obtained which supports the belief that the rate controlling step of the hydrolysis is not one of ionization for it was found that the addition of sodium chloride solution, thus increasing the ionic strength, produced no observable change in the rate constant.

A plot of the logarithm of the rate constant against $1/T$ is essentially a straight line which indicates there is no apparent change in the activated complex. From this one concludes that the mechanism undergoes no change over the temperature range studied. From this plot it is also possible to determine the energy of activation to be approximately 12.0 kcal.

A plot of $(D-1)/(2D+1)$ against the logarithm of the rate constant yields essentially a straight line indicating the change of rate constant is consistent with the change in dielectric constant. However at the lower end of the curve a break from linearity appears, indicating other effects are appearing. A plot of the logarithm of the rate constant against the logarithm of the moles of water yields essentially a straight line over the solvent range studied. The slope of this line gives the value of about 3.4 for the power of the dependence of the rate constant on water concentration. Over the solvent range studied in this investigation, the effect of water on the rate is consistent, although at the upper limit of the water concentrations investigated larger deviations from the straight line appear, indicating that possibly the dependence of the rate on water concentration is starting to change.

Analysis of the data shows that the hydrolysis proceeds by means of a pseudo-first-order reaction in parallel with two consecutive first-order reactions. Two mechanisms which are consistent with these findings are postulated. In the first the original benzenesulfonyl chloride is hydrated and this hydrate either hydrolyzes to the corresponding products of hydrolysis or the original hydrate can be further hydrated before hydrolysis takes place. In the second, the two hydrates are postulated to be hydration isomers. The data obtained are consistent with either of these mechanisms; however, sufficient data have not been obtained to permit a choice.

The rates of hydrolysis of pyridine 3-sulfonyl chloride were determined in different dioxane-water solutions at 15°C . This investigation necessitated a constant pH because the products formed on hydrolysis would react with the pyridine ring and form pyridinium salts. A pH of 8.0

was chosen because it is nearly neutral yet basic enough to prevent the previously mentioned salt formation.

The rate of hydrolysis of pyridine 3-sulfonyl chloride was found to be approximately 7.4 times that of benzene-sulfonyl chloride under the same conditions. A comparison of the relative rates of hydrolysis was also made with those of meta-nitrobenzenesulfonyl chloride and para-nitrobenzenesulfonyl chloride as reported by Hedlund (1) in an attempt to determine the effect of the above mentioned substituents on the activity of the S-Cl bond of the sulfonyl chloride group. From this comparison one concludes that the m-pyridyl group is more effective than the p-nitrophenyl or the m-nitrophenyl group in activating the S-Cl bond.

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EXCITATION MECHANISMS IN PHOTOREDUCTION OF KETONES

(L. C. Card No. Mic 60-584)

William Marshall Moore, Ph.D.

Iowa State University of Science and Technology, 1959

Supervisor: George S. Hammond

A mechanism for the photoreduction of benzophenone by benzhydrol, (BH₂), involving simple competition between hydrogen transfer and collisional deactivation of an excited state gives the following rate law which fits the experimental data. The quantum yield for the disappearance of benzophenone is ϕ_B , k_d is the rate constant for colli-

$$1/\phi_B = 1 + \frac{k_d(BH_2)}{k_T}$$

sional deactivation, and k_T is the rate constant for hydrogen abstraction. The intercept for $1/\phi_B$ is 1.0 indicating that all excited molecules pass through the chemically reactive state. The slope, k_d/k_T , is 0.050. Consideration of this number compels the conclusion that the triplet state is responsible for the chemical reaction. The largest value that k_T can be imagined to have is 10^9 liter mole⁻¹ sec.⁻¹, the diffusion controlled rate. This gives an upper limit of 5×10^7 sec.⁻¹ for k_d . Fluorescence rate constants for singlet states are believed to be of the order of 10^8 sec.⁻¹ (lowest value, 10^6 sec.⁻¹). The maximum rate constant for deactivation is too slow to completely quench fluorescence, which has not been observed in solutions of benzophenone. This evidence necessitates a long-lived state as the chemically reactive species.

Hydrogen abstraction must be much slower than diffusion-controlled, since a substantial isotope effect ($k_T(H)/k_T(D) = 2.7$) was observed when α -deuterobenzhydrol was used as the hydrogen donor.

In the presence of paramagnetic quenchers, the rate law becomes more complex. The rate constant for quenching is k_q , and (M) is the concentration of quencher. In the

$$1/\phi_B = 1 + \frac{k_d + k_q(M)}{k_T(BH_2)}$$

presence of oxygen ($\sim 10^{-3}$ M), the value of $(k_d + k_q(M))/k_T$ is 2.8. Therefore, k_q/k_T is 230. The rate constant for the quenching of phosphorescence is known to be usually of the order 10^9 liter mole⁻¹ sec.⁻¹. Assuming the rate constant for the quenching of the triplet state of benzophenone is similar (5×10^9), the important rate constants can be evaluated: k_T is 2×10^7 liter mole⁻¹ sec.⁻¹, and k_d is 1×10^6 liter mole⁻¹ sec.⁻¹. Ferric dipivaloylmethide, a paramagnetic chelate, quenches as efficiently as oxygen.

A simple mechanism can explain the observed results. The $\eta \rightarrow \pi$ transition of benzophenone is produced by light of 3660 Å., and the molecule is excited to a higher singlet state. Intersystem crossing to the triplet state is very efficient and occurs before the singlet can be deactivated. The triplet is then deactivated by: chemical reaction with a hydrogen donor, collisional deactivation by solvent molecules, and quenching by paramagnetic molecules.

Microfilm \$2.50; Xerox \$5.00. 97 pages.

A REVERSIBLE DROPPING GALLIUM AMALGAM ELECTRODE

(L. C. Card No. Mic 60-777)

Edward Darrell Moorhead, Ph.D.

The Ohio State University, 1959

The electrode reactions of gallium have long been known to exhibit an unusually high degree of irreversibility in aqueous solutions. A polarographic study was therefore undertaken to determine the extent of this irreversibility.

Since a comprehensive investigation of polarographic reversibility includes the study of anodic, composite and cathodic waves it was necessary to investigate, for the first time, the preparation and use of a dropping gallium amalgam electrode with which to obtain polarographic data.

Gallium amalgams prepared with "specpure" gallium were found suitable for polarographic purposes at concentrations of 5×10^{-4} per cent or less. The "as received" gallium pellet was found to dissolve in mercury with difficulty. A procedure was developed for pretreating the gallium metal whereby the solid gallium pellet was first covered with warm (30°C.) 1. molar HCl which removed the adherent oxide layer. The resulting globule of liquid gallium was then frozen in cold ethanol which yielded a solid pellet that was easily dissolved in mercury. The resulting amalgam was stable in contact with glass and High Purity nitrogen.

The composite curves obtained with the dropping gallium electrode in 0.1 molar KNO₃ and 0.5 millimolar Ga(NO₃)₃ indicated an overpotential of 0.29 volts; gelatin was used as a maximum suppressor.

The anodic, composite and cathodic waves obtained in 7.5 molar KSCN were reversible and were shown to be diffusion controlled. No maximum suppressor was required.

Cathodic curves in this medium showed two waves occurring at -0.900 and -1.13 volts vs. S.C.E. The second wave was time dependent.

A plot of Ga^{+3} vs. i_d was linear above 0.3 millimolar Ga^{+3} in 7.5 molar KSCN.

The anodic, composite and cathodic waves of indium were studied as a comparison, and the hydrolysis constants calculated for both gallium and indium from data obtained from the polarographic hydrolysis waves agreed well with the literature values.

It was concluded that the anodic wave obtained with the dropping gallium amalgam electrode would furnish a convenient tool with which to determine gallium complexity constants.

It was further concluded that solutions very high in KSCN offer an excellent means of determining gallium electroanalytically.

Microfilm \$2.70; Xerox \$9.45. 207 pages.

STUDIES IN THE MECHANISMS AND KINETICS OF VINYL POLYMERIZATION

(L. C. Card No. Mic 59-5208)

Kenneth F. O'Driscoll, Ph.D.
Princeton University, 1958

The rates of polymerization and the degrees of polymerization produced in methylmethacrylate by the initiator-activator system benzoyl peroxide - dimethylaniline were studied at low temperatures. The initiation of polymer chains appears to result from a bimolecular reaction between amine and peroxide, since the temperatures used were below those at which benzoyl peroxide alone would appreciably initiate polymerization. The activation energy for initiation is calculated to be 12.8 kcal.

Previous attempts to ascertain the mechanism of termination in the polymerization of methylmethacrylate are reviewed and new data are presented. Samples of polymethylmethacrylate were prepared and the weight and number average degrees of polymerization were determined. The ratio of weight to number average degree of polymerization is indicative of the termination mechanism. The general problem of the mechanism by which free radicals are terminated must be considered as unresolved.

The copolymerization of styrene and methylmethacrylate has been investigated using lithium metal as an initiator. The copolymer initially produced from mixtures of the two monomers was analyzed for styrene content by means of the ultraviolet absorption at 269 millimicrons of a 1.0 mgm/ml solution of the polymer in chloroform. The absorbance at this wave length is attributed to the phenyl group in styrene and was correlated to the styrene content of the polymer by means of carbon-hydrogen analyses.

Initially equimolar mixtures of the two monomers were copolymerized and it was observed that the styrene content of the low conversion polymer (8-20%) was higher than what would be expected if polymerization took place via an anionic mechanism (less than 1% expected) and lower than what would be expected if a free radical mechanism was operative (50% expected). Furthermore it was observed that the amount of styrene found in the lithium initiated copolymer was very dependent on the solvent used for polymerization. In general, the trend noted was for a more highly ionizing solvent to give less styrene.

A study of the solution properties of copolymer produced by lithium initiation showed that copolymer containing styrene was soluble in acetonitrile, a non-solvent for a

styrene-methylmethacrylate copolymer produced by free radical catalysis.

On the basis of the styrene contents of copolymer the solution properties of the copolymer and several other experiments, it is proposed that lithium metal initiates copolymerization by electron transfer to the low lying, unoccupied orbital of the vinyl double bond. Formally, this can be considered to yield an anion at one end of the molecule and a free radical at the other. Both ends are capable of propagating polymerization in their own manner: in an equimolar mixture of styrene and methylmethacrylate the anion will add only methylmethacrylate while the radical will randomly add both monomers. This will yield a block copolymer of poly methylmethacrylate attached to a random copolymer of methylmethacrylate and styrene.

Data were also obtained in tetrahydrofuran and in hydrocarbons for copolymer composition as a function of monomer feed composition. Similar data were also obtained for typical anionic catalysts such as n-butyl lithium and phenyl sodium and for sodium metal.

The kinetics of the homopolymerization of styrene initiated by n-butyl lithium in benzene and in benzene plus small amounts of tetrahydrofuran were investigated. It was found that the rate of polymerization is independent of n-butyl lithium concentration over a 100-fold range in pure benzene. In benzene plus small amounts of tetrahydrofuran the rate is inversely proportional to the n-butyl lithium concentration. A reaction scheme is suggested to explain these unusual kinetic results.

Microfilm \$2.50; Xerox \$4.40. 81 pages.

A STUDY OF HYDROGEN ISOTOPE EXCHANGE EFFECTS IN A THERMAL DIFFUSION COLUMN

(L. C. Card No. Mic 60-25)

Russell W. Pierce, Ph.D.
Columbia University, 1959

A hot wire thermal diffusion column was operated while filled with the components of the reaction, $HD + H_2O \rightleftharpoons H_2 + HDO$. The equilibration was catalyzed by platinum at the cold wall. Steam was fed to the top of the column while the base was maintained at nearly 100% hydrogen by chemically converting the water transported down through the column. The average filament temperature was approximately 400°C, and the cold wall was at 108°C. Under these conditions, an overall separation factor of 1.48 was observed for hydrogen isotopes.

A separation factor of 2.3 was attained by the same apparatus when operated as a thermal diffusion column using HD and H₂ alone. The combination of thermal diffusion and chemical exchange thus proved less effective for the separation of hydrogen isotopes than did the thermal diffusion column separation of HD and H₂ alone in the system.

A theoretical treatment has been made of the mechanisms within the column by postulating a hypothetical two-bulb, single stage apparatus in which thermal diffusion occurs between the two bulbs and in which isotope equilibration takes place among the cold bulb components. The numerical values for the single stage separation factors found for various conditions have then been used to find

the over-all separation factor for a column of cascaded single stage elements. The result obtained was in good agreement with the factor observed with the experimental column. Examination of the mechanisms involved in the hypothetical two-bulb apparatus disclosed the reason for the lowered separation power of the thermal diffusion-chemical exchange operation over that for thermal diffusion of isotopic hydrogen alone.

To maximize the isotope exchange effect, the hypothetical apparatus was made equimolar in hydrogen and water vapor. Since the thermal diffusion separation obtainable from HDO and H₂O is negligible, that part of the over-all apparatus separation factor created by the thermal diffusion of HD and H₂ was reduced to approximately half what it would have been had the single stage contained only these two gases. Because isotope exchange is confined strictly to the one section of the apparatus, no isotope is transported from one zone to the other as a direct result of equilibration and, therefore, no direct contribution is made to the over-all separation factor by the action of isotope equilibration. However, changes in cold bulb component concentrations as a consequence of equilibration upset the thermal diffusion steady state concentrations. Subsequent re-establishment of the thermal diffusion steady state did give rise to transport of heavy isotope into the cold bulb as HD molecules and in excess of the HDO molecules which left the cold zone. In this respect only does chemical exchange operate to increase the separation factor.

Owing to the separation of water vapor and hydrogen by thermal diffusion which may occur in the column, simple, process elements composing the cascaded column may diverge from an equimolar condition, optimum for the exchange reaction separation, as the ends of the apparatus are approached. As a result, the isotope equilibration contribution to the total separation factor for the column may decrease toward the top and toward the bottom of the apparatus. Hence, the over-all column separation factor may be less than expected for a cascade of thermal diffusion-chemical exchange elements, all equimolar in hydrogen and water vapor.

Microfilm \$2.50; Xerox \$8.80. 191 pages.

DIFFUSION IN SILVER CHLORIDE SINGLE CRYSTALS: Ag⁺, Cl⁻ AND Cd⁺⁺.

(L. C. Card No. Mic 60-588)

Richard Francis Reade, Ph.D.

Iowa State University of Science and Technology, 1959

Supervisor: Don S. Martin

The rates of diffusion of silver, chlorine and cadmium ions in single crystals of silver chloride have been investigated by means of a variation of the surface counting technique. The diffusion equation for a semi-infinite medium has been graphically evaluated by the use of an empirically determined absorption curve for the isotope under consideration. The mathematical development of the method is discussed in detail and the advantages of this method over those which incorporate a linear absorption coefficient are noted. An improved counting system for use in diffusion investigations which utilize the surface counting technique is described.

The temperature dependence of the diffusion coefficient of silver in silver chloride may be expressed by an Arrhenius equation of the form $D = 9.36 \exp(-1.01/kT)$ cm²/sec where the activation energy is given in units of electron volts. Above 300°C, the measured diffusion coefficients agree well with values obtained by means of the sectioning method, but are somewhat lower at temperatures less than 300°C.

A plot of the temperature dependence of the diffusion of the chlorine isotope exhibits a large change in slope below 350°C. An estimation of the activation energies gives a value of 1.57 ev in the high temperature region and 0.37 ev in the low temperature region.

The temperature dependence of the diffusion of cadmium in silver chloride may be expressed by means of the equation $D = 32.8 \exp(-1.36/kT)$ cm²/sec + $2.35 \times 10^{-5} \exp(-0.56/kT)$ cm²/sec. Qualitative observations have been made with respect to the possible significance of the diffusion of chlorine and cadmium.

Microfilm \$2.50; Xerox \$4.40. 83 pages.

THE MICROWAVE SPECTRUM OF PYRIMIDINE

(L. C. Card No. Mic 60-43)

Robert Fournier Schneider, Ph.D.

Columbia University, 1959

The microwave spectra of pyrimidine and 2,4,6-trideuteropyrimidine have been observed, and rotational constants for the two molecules have been calculated. The information so derived does not permit a complete structure determination for pyrimidine but a structure consistent with the experimental moments of inertia is proposed and discussed. The experimental rotational constants found for normal pyrimidine are A=6276.84 Mc., B=6067.29 Mc. and C=3084.34 Mc. Those for 2,4,6-trideuteropyrimidine are A=5692.48 Mc., B=5457.33 Mc., and C=2785.76 Mc. The following structural model reproduces these constants to within 50 Mc. d(C-N)=1.34 Å, d(C-C)=1.39 Å, d(C-H)=1.09 Å for the C-H bond between the two nitrogen atoms, d(C-H)=1.085 Å for the C-H bonds adjacent to but not between the nitrogen atoms and d(C-H)=1.08 Å for the remaining C-H bond. The two necessary ring angles are $\angle NCN=60^\circ$, $\angle NCC=121^\circ$, and the NCH angle is 120.4° .

Microfilm \$2.50; Xerox \$3.00. 26 pages.

ELECTROCHEMICAL AND PHYSICAL PROPERTIES OF SOLUTIONS OF ZINC CHLORIDE IN THE MIXED SOLVENT, METHANOL-ACETONE, OVER THE TEMPERATURE RANGE -50°C. TO 20°C.

(L. C. Card No. Mic 60-699)

Francis Joseph Shell, Ph.D.

University of Kentucky, 1953

That the conductance of zinc chloride in non-aqueous solutions^{1,2,3} displays a maximum as a function of concentration has been known for some time. Mead and Fuoss⁴ found a maximum in the curve of conductance as a function

of concentration for aqueous zinc chloride solutions using technical grade materials. In order to carry out a systematic study of the conductance of zinc chloride the mixed solvent, methanol-acetone, was selected. With such a solvent mixture it was possible to vary the viscosity and dielectric constant of the solvent by varying the relative amounts of the components. To make the study more complete over the rather large concentration and temperature ranges investigated physical properties related to conductivity were determined for the solutions. It was also necessary to determine physical and electrochemical properties of the solvent mixture.

Results

Experimental conductivities were corrected for the conductivity of the solvent. Summaries of pertinent data are presented in tables.

Discussion

Since the Conductance of the solutions failed to yield finite values for the limiting equivalent conductance by any of the conventional methods, an empirical equation was developed. This equation allowed treatment of the data by

$$\log \Lambda = e(\Lambda C)^{\frac{1}{2}} \quad (1)$$

the method of least squares to yield values for the limiting equivalent conductance. These values were compared with values calculated from reasonable assumptions.

Conductance as it changes with temperature is shown to be a complex function of viscosity and dielectric constant. As the temperature is decreased the conductance at first increases and then decreases after passing through a maximum.

The energy of activation of viscous flow was determined from a relation by Eyring⁵ assuming the entropy of activation of viscous flow did not change with temperature.

$$E_{vis.} = R \frac{d \ln \eta}{d (1/T)} \quad (2)$$

It was shown that solutions having a small energy of activation of viscous flow are more likely to have negative temperature coefficients of conductivity.

From studies of the apparent molal volume it was seen that reactions between zinc chloride and the solvent probably exist. Microfilm \$2.50; Xerox \$6.20. 128 pages.

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THE USE OF A THERMISTOR MANOMETER FOR THE MEASUREMENT OF HEATS OF SUBLIMATION

(L. C. Card No. Mic 60-367)

John Ritter Sutter, Ph.D.
Tulane University, 1959

Chairman: Thomas F. Fagley

In order to calculate the bond energy of a particular functional group in an organic molecule as a solid, it is necessary to know the heat of sublimation of the compound in addition to the heat of combustion. The energies must be compared in the gaseous state for adequate descriptions, thus eliminating other forces than valence forces.

It is the purpose of the present work to obtain precise measurements of the heat of sublimation of compounds exhibiting low vapor pressures at 25°.

Effusion techniques, which depend on the determination of the loss in weight per unit area per unit time, fail to give satisfactory results unless the compound has a rather high vapor pressure. On the other hand, methods dependent on the measurement of the conductivity of heat by the gas are better suited to compounds having lower vapor pressures.

The present work employed a modified Pirani-Hale gauge with a thermistor as the hot filament. One hot element, enclosed in an evacuated glass manometer containing the compound, is used. The hot element, which is one arm of a Wheatstone bridge, is held at a constant high temperature at all pressures by fixing the other three resistances of the bridge and varying the voltage to the bridge until a balance is obtained.

A thermistor, or thermally sensitive resistor, is a device constructed from manganese, nickel, and cobalt oxides, having a high negative temperature coefficient of resistance. If a small current is passed through a thermistor, the power dissipated is too small to heat the thermistor appreciably and Ohm's law is followed. As the current is increased, the power dissipated increases and the thermistor temperature rises with a corresponding decrease in resistance. At some value of the current the voltage reaches a peak value, V_m , known as the self-heating voltage. Beyond this point the curve has a negative slope. It is here, the region beyond V_m in the relatively high current region that the thermistor is pressure-sensitive, in that the thermal conductivity or power dissipated by the thermistor is dependent on the pressure.

Energy is dissipated from a heated surface in two ways: (1) by radiation and (2) by conduction through the gas. In addition, energy may be dissipated through the supporting leads of the hot body. By applying the kinetic theory of gases to describe the above three modes of energy loss, a relation between pressure and power dissipated by the thermistor can be derived. In deriving the expression one considers the power dissipated by the thermistor held at two different high temperatures, while the cold surface is kept at a single fixed temperature. The equation is:

$$P = P_0 + C p/\sqrt{T}$$

where P = power dissipated by the thermistor at the saturation pressure of the solid compound under investigation

P_0 = power dissipated by the thermistor at zero pressure ($\sim 10^{-6}$ mm. Hg)

p = vapor pressure of the compound

T = absolute temperature of the surroundings

C = a constant

By combining this equation with the integrated Clausius-Clapeyron equation one obtains:

$$\log (P - P_0) + 1/2 \log T = -\Delta H_s / 2.303RT + \text{Constant}$$

where ΔH_s is the heat of sublimation of the compound and R is the gas constant.

The heats of sublimation of the following compounds have been obtained: benzoic acid, 19.60 ± 0.12 kcal; benzofuroxan, 12.79 ± 0.07 kcal; and urea, 20.86 ± 0.05 kcal. The heats of sublimation of these compounds have not previously been reported in the vicinity of room temperature, although benzoic acid and urea have been measured fifty degrees above room temperature.

The over-all precision of the heats of sublimation obtained in this work is 0.5 per cent. These values, used in conjunction with the heats of combustion of these compounds will permit a more precise estimation of bond energies.

The range of this method is perhaps limited. The lower limit is set by the maximum vacuum obtained with the present apparatus. Of the three possible ways that heat energy may be dissipated, only that conducted away by the supports must be kept to a minimum. The total energy available for dissipation is, of course, constant for any given fixed temperature of the hot body. Thus, in order to make the conduction of heat through the gas itself the most important factor, it is necessary to minimize the effect of the supports, since it would be impossible to eliminate radiation effects of the hot body. The effect of the supports may be minimized by reducing the conductivity of the leads, by reducing the cross-sectional area, and by increasing the length of the leads. Further, the heats of sublimation of compounds having high vapor pressure could be measured by lowering the temperature of the bath until the vapor pressure of the compound fell in the working range of the thermistor manometer. If these things were done, the upper pressure limit of the method would be increased to some value above 10^{-2} mm. Hg. (The present limitations are set between 10^{-5} and 10^{-2} mm. Hg.) It is not known if the upper pressure limit could be raised sufficiently to allow the heat of sublimation of compounds such as naphthalene to be measured, but it is possible that the upper linear relationship between pressure and power could be extended to 0.1 mm. Hg.

Microfilm \$2.50; Xerox \$3.00. 48 pages.

A STUDY OF THE EXTENT OF HYDROGEN BONDING IN POLYMERS OF THE POLYAMIDE AND POLYURETHANE TYPES

(L. C. Card No. Mic 59-5231)

Joseph F. Terenzi Jr., Ph.D.
Princeton University, 1959

A study of the extent of hydrogen bonding in polymeric systems of the polyurethane and polyamide types, using infrared absorption techniques is presented. The spectrometer employed was a Perkin-Elmer, Model 21, with LIF optics.

At room temperature the polyamides generally revealed normal extended chain amide absorptions at ca. 3290 cm^{-1} (shoulder) and 3067 cm^{-1} , and interpretations are discussed. A large broad shoulder over the range $2.8\text{--}2.9\mu$ was observed which had previously been misinterpreted as being attributable to free NH. In the present work it was shown that the free NH absorption, when present, is at ca. 2.9μ (3448 cm^{-1}), and does not extend over the range noted above. The polyurethanes generally showed bands corresponding to those of the polyamides at 3320 cm^{-1} , and 3049 cm^{-1} . No large, broad shoulder complicated the polyurethane spectra but a small absorption or bulge at ca. 2.9μ was observed at room temperature in the higher members of a homologous series. This small absorption was attributed to free NH, and in copolyurethanes and other irregular systems this same absorption was slightly more intense as would be expected. Subsequent quantitative calculations showed the higher members of the polyurethanes (both "odd" and "even" polymers) to contain ca. 0.7-0.9% free or unbonded NH, and results taken from the 6-6;6-10 copolyurethane showed about 1.5%. The fact that most of the polyurethanes contained a small free NH band at room temperature and no appreciable free NH could be observed in the polyamides, was interpreted on the basis of the relatively increased flexibility of the polyurethane chains.

The absorption spectra of the 6-8 and 6-9 polyurethanes, polycaprolactam, 6-6 and 6-9 polyamides, crystalline diurethane and diamide model compounds, and special cross-linked polyurethane networks, were studied over a range of temperatures which extended from room temperature to temperatures well above the melting point in each case. The absorption spectra revealed three general changes with increasing temperature in each case: (1) the band at ca. 2.9μ (3448 cm^{-1}) increased in intensity, (2) the main bonded absorption at ca. 3300 cm^{-1} shifted gradually to a higher frequency in each case and (3) the small band at ca. 3067 cm^{-1} in the polyamides and 3049 cm^{-1} in the polyurethanes gradually disappeared with increasing temperature and disappeared completely at different temperatures well above the melting points in each case. The 2.9μ band, as well as its temperature dependence, had not been previously reported in any of these polymeric systems and it was discussed and quantitatively interpreted in the present work in terms of essentially complete hydrogen bonding in all these materials and of the hydrogen bond rupturing at higher temperatures.

The absolute area intensity method was applied to the free NH absorption and area intensity coefficients, obtained on N-methyl acetamide and a model diurethane in solution, were applied to the polyamide and polyurethane systems, respectively, thus permitting a rough

approximation of the percentage free NH in all of these materials at and above room temperature. No significant difference in the percent free NH was noted between the "odd" and "even" polymers in both the case of the polyamides and the polyurethanes, the polyurethanes having less than 1% unbonded NH at room temperature and the polyamides having even less. In the polyamides, no appreciable NH absorption was observed until ca. 100° C. while the polyurethanes contained ca. 2-3% at this temperature. These results were in accordance with the interpretation comparing the polyamides and polyurethanes at room temperature which involved consideration of the more flexible polyurethane chains. At higher temperatures, the 6-8 polyurethane taken as an example, the percent free NH present at 175° C. went as high as 1.5%.

Equilibrium and thermodynamic information was obtained from the spectral data on the basis of the reversible reaction:



The calculated values of $-\Delta H$ for the energy of formation of the hydrogen bond showed no significant differences between the various materials, and were within the range of 4.00-12.50 kcal./mole. A consideration of the experimental errors involved in the experimental procedure indicated that our values checked rather well with reported values which were obtained on amide compounds capable of forming hydrogen bonds in solution.

Finally, the general physical and chemical characteristics of these materials were interpreted on the basis that all the polymers of the polyamide and polyurethane types are essentially completely hydrogen bonded.

Microfilm \$2.50; Xerox \$6.60. 138 pages.

STRUCTURES AND PHASE EQUILIBRIA OF BINARY RARE EARTH METAL SYSTEMS

(L. C. Card No. Mic 60-594)

Robert Michael Valletta, Ph.D.

Iowa State University of Science and Technology, 1959

Supervisor: A. H. Daane

The phase diagrams of the lanthanum-yttrium, gadolinium-yttrium and gadolinium-yttrium systems have been determined. The lanthanum-yttrium and lanthanum-gadolinium systems were very similar and differed only in the composition ranges of the various phases and the transition temperatures. There is a eutectoid horizontal associated with b.c.c. decomposing to the f.c.c., α' La phase and the α La, hexagonal ABAC, phase. There is a peritectoid horizontal, α La decomposing to α Gd or α Y, ABAB stacking, plus b.c.c. Both systems have an intermediate phase, δ phase, with a structure similar to the structure of samarium, which decomposes to α Gd or α Y plus α La by a peritectoid reaction. Two phase regions, $\delta + \alpha$ La and $\delta + \alpha$ Gd or Y, were found in both systems. The addition of gadolinium or yttrium increases the α La to α' La transition temperature. Both systems exhibited complete solid solubility below the melting point of the alloys. This indicated that the high temperature form of yttrium and gadolinium were b.c.c. Extrapolation of the

thermal data showed the transition temperature of yttrium to be $1490^\circ \pm 20^\circ$ C. The phase regions at room temperature in the lanthanum-yttrium system were α La from 0 to 44 ± 1.5 atomic percent yttrium, $\delta + \alpha$ La from 44 to 50 ± 1.0 atomic percent yttrium, δ from 50 to 55 ± 1.0 atomic percent yttrium, $\delta + \alpha$ Y from 55 to 60 ± 1.0 atomic percent yttrium and α Y from 60 to 100 atomic percent yttrium. The phase regions at room temperature in the lanthanum-gadolinium system were α La from 0 to 58 ± 1.0 atomic percent gadolinium, $\delta + \alpha$ La from 58 to 68 ± 2.0 atomic percent gadolinium, δ from 68 to 80 ± 2.0 atomic percent gadolinium, $\delta + \alpha$ Gd from 80 to 83 ± 1.0 atomic percent gadolinium and α Gd from 83 to 100 atomic percent gadolinium.

Table 1. Lattice constants of samarium structure alloys

Composition (atomic percent)	a (Å)	c (Å)
44.5 a/o Ce-55.5 a/o Y	3.653 ± 0.007	26.55 ± 0.02
49.7 a/o Pr-50.3 a/o Y	3.648 ± 0.007	26.41 ± 0.04
53.0 a/o Nd-47.0 a/o Y	3.665 ± 0.007	26.45 ± 0.02
47.95 a/o La-52.05 a/o Y	3.699 ± 0.007	26.70 ± 0.05
30.1 a/o La-69.9 a/o Gd	3.667 ± 0.001	26.482 ± 0.007
63.0 a/o Nd-37.0 a/o Tm ^a	3.656 ± 0.003	26.36 ± 0.02

^aTwo phase alloy. Also contains phase with lattice parameters $a = 3.763 \pm 0.007$ Å and $c = 12.32 \pm 0.01$ Å.

The gadolinium-yttrium system showed complete solid solubility in the room temperature and high temperature forms. Samarium structure alloys were also found in cerium-yttrium, praseodymium-yttrium, neodymium-yttrium and thulium-neodymium alloys. The lattice constants of some of the δ phase alloys are summarized in Table 1. Microfilm \$2.50; Xerox \$4.60. 88 pages.

A CONDUCTIMETRIC AND VISCOMETRIC STUDY OF SOME UNI-UNIVALENT ELECTROLYTES IN THE PURE LIQUIDS AND IN MIXTURES OF DIMETHYLFORMAMIDE AND N-METHYLACETAMIDE

(L. C. Card No. Mic 60-717)

Walter Washington Wharton, Ph.D.
University of Kentucky, 1955

Supervisor: Lyle R. Dawson

This study investigates the conductance behavior of some uni-univalent electrolytes in the pure liquids and in mixtures of the two isomers, N-methylacetamide and dimethylformamide.

N-Methylacetamide was synthesized by bubbling monomethylamine through glacial acetic acid and then eliminating water from the monomethylammonium salt formed. The impure N-methylacetamide was distilled at atmospheric pressure and purified further by a method of fractional crystallization. Dimethylformamide was purified by fractional distillation at a pressure of approximately 2 cm. of mercury.

Sodium bromide was purified by first washing with

anhydrous methanol and then fusing in a platinum crucible. Potassium bromide was recrystallized twice from a 50-50 water-ethanol mixture and then fused. Potassium iodide was recrystallized twice from water solutions and dried over night in a vacuum oven at 60° C. All salts were stored over magnesium perchlorate and dried an hour at 110° C. before using.

All solutions and mixed solvents were prepared on a weight basis and appropriate corrections were made for air buoyancy. The weight-based concentrations were changed to volume-based ones by utilizing density data obtained with spherical bulb pycnometers containing approximately 25 ml.

Resistance measurements were made with the Dike modification of the Jones and Josephs bridge. The cells were calibrated using 0.1 and 0.01 normal potassium chloride solutions.

The four size-50 Ostwald-Cannon-Fenske type viscometers used were calibrated with water and two Bureau of Standards silicone viscosity oils.

Dielectric constants were determined by use of a Twin-T impedance measuring circuit. The cell used has been described by Leader. It was recalibrated in this work using air, benzene, nitrobenzene, and water as the calibrating substances.

The conductance behavior was similar for all three salts in dimethylformamide. Kohlrausch plots were curves typical of slightly associated electrolytes in aqueous systems. However, using a less negative slope than the theoretical predicted by the Debye-Hückel-Onsager equation and the size of the thermodynamic dissociation constant as criteria of complete dissociation, it has been observed that dissociation is essentially complete for solutions less concentrated than about 0.008 normal. The limiting equivalent conductance of potassium iodide was about one per cent less than the other two salts.

In the mixed solvent 90 per cent N-methylacetamide--10 per cent dimethylformamide complete dissociation occurred over a considerably greater concentration range than in pure dimethylformamide. However, potassium iodide was more conducting than the other two salts by about ten per cent in the 90-10 mixed solvent. Similar behavior of potassium iodide was observed also in pure N-methylacetamide.

The greatest degree of dissociation was found in the 50-50 mixed solvent even though the dielectric constant of this solvent was in excess of 100 dielectric units less than that of the pure N-methylacetamide. In pure N-methylacetamide a slope more negative than the theoretical was observed, indicating some association of the ions of the solute in this solvent having an extremely high dielectric constant.

From an observation of phenomena such as increased dissociation as the dielectric constant of the solvent becomes less and reversal of the conductance behavior of potassium iodide with respect to the other two salts in dimethylformamide and N-methylacetamide, evidence of solute-solvent interaction has been presented. It appears that factors other than the dielectric constant must not only be considered but may be actually much greater in predicting the dissociating power of many solvents.

Microfilm \$2.50; Xerox \$6.20. 129 pages.

PROTON MAGNETIC RESONANCE IN SIMPLE UNSATURATED SYSTEMS

(L. C. Card No. Mic 59-6953)

Earl Bennett Whipple, Ph.D.
Emory University, 1959

This work had two principal objectives: (1) to determine the most reliable and practicable means for measuring intramolecular shieldings and nuclear spin-spin interactions between protons in molecules; and (2) to apply the techniques to a systematic study of a few selected molecular types in an effort to understand better how these parameters relate to the electronic, and hence ultimately the chemical, properties of the systems. Three basic types of unsaturated skeletal chains were chosen, the propargyl, allenic, and propenyl, and substituent effects at selected positions were usually studied over the series H, Cl, Br, I. Some twenty-six spectra were completely analyzed. The chemical shifts showed evidence of effects from at least four sources: (1) intramolecular electronic effects, both inductive and resonance; (2) anisotropic shielding from neighboring groups; (3) medium effects and intramolecular interaction effects; and (4) conformational effects. The couplings appeared to be subject both to electronic and conformational effects, the latter of which may assume the form of medium effects. In spite of the number of factors involved, both types of parameter showed regularities which can be related to other known properties of the molecules and which promise a useful variety of fundamental information on the systems concerned.

Microfilm \$2.50; Xerox \$6.40. 132 pages.

TRIGGER EFFECTS IN SPONTANEOUS ELECTROLYSIS

(L. C. Card No. Mic 60-807)

Richard Mac Wilson, Ph.D.
The Ohio State University, 1959

A potential difference and current flow were observed between two previously unpolarized aluminum electrodes of identical composition and history but of different surface areas when placed in 0.2 M acetic acid and shorted. For example, a cell consisting of two aluminum electrodes with approximate surface areas of 1.8 and 2.8 square centimeters gave a potential of 18 millivolts and a current flow of 2.5 microamperes. The smaller electrode was found consistently to be the anode.

None of the factors, such as stress, concentration or thermogalvanic effects, known to cause a potential difference between two like electrodes, is applicable to this behavior. Also, factors such as the chemical composition or shape of the electrodes and the exposed metal corners and edges are not significant.

Several factors have been found that were significant in the behavior of two aluminum electrodes in solution.

The magnitude of the potential difference and current flow was affected by the size and size ratio of the two electrodes. Electrodes with exposed surface areas of approximately 1.8 and 2.8 square centimeters appeared to give the maximum response.

A triggering agent, such as fluoride, added to the solution produced a pronounced increase in the potential difference and current flow. For example, electrodes with approximate surface areas of 1.8 and 2.8 square centimeters immersed in 35 milliliters of 0.2 M acetic acid gave a potential of 35 millivolts and a maximum current flow of 14.3 microamperes when 20 micrograms of fluoride (as NaF) was added to the solution.

The result of continued reduction of the size of the larger electrode was zero current flow when the sizes were equal and flow in the opposite direction when the relative sizes were reversed. The polarity was also reversed by directing the flow of added fluoride in the vicinity of the larger electrode. However, this polarity reversal was only temporary and the normal polarity was restored in a few seconds.

Factors such as the preliminary treatment of the two electrodes, differential stirring, ultrasonic energy and the length of time the electrodes were exposed to the solution before use were found to alter the magnitude of the potential difference. These were, however, not causative factors in the origin of the potential difference. The potential difference was decreased to a negligible value by exposing both electrodes to extreme but similar conditions of oxidation or reduction. Exposure of a galvanic cell consisting of two aluminum electrodes to ultrasonic energy caused the current flow between two electrodes to drop almost immediately to zero. The response of a pair of electrodes that

was allowed to stand in solution for increasingly longer intervals of time before use increased at first, but reached a maximum and then decreased.

The potential difference between two aluminum electrodes occurred in a relatively narrow pH range. The potential difference and current flow was the greatest between pH 2.5 and 4.0. In addition to pH, the potential difference was dependent on the electrolyte in the cell. Solutions of 0.2 M formic, acetic, propionic, and n-butyric acids were used. The decreasing order of magnitude of the potential response occurred in solutions of formic, acetic, propionic, and n-butyric acids.

The potential difference between two aluminum electrodes of unequal size was explained in terms of a difference in cathode areas of the two electrodes with the aid of a polarization diagram. The portion of metal near the wax-metal-solution interface was found to be anodic with respect to the remainder of the electrode. Thus, on one electrode there are anodic and cathodic sites and the difference between the two electrodes arises from the difference in the cathode areas of the two electrodes.

Two zirconium electrodes immersed in 0.2 M perchloric acid exhibited the same behavior as two aluminum electrodes.

The potential difference between the two aluminum or zirconium electrodes is not an equilibrium condition and thus does not conflict with the Laws of Thermodynamics.

Microfilm \$2.50; Xerox \$8.60. 188 pages.

ECONOMICS

ECONOMICS, GENERAL

STATE PER CAPITA AUTOMOBILE EXPENDITURES AND INCOME 1930, 1940, AND 1950.

(L. C. Card No. Mic 60-260)

Robert Angus Bandeen, Ph.D.
Duke University, 1959

Supervisor: Frank A. Hanna

Per capita automobile expenditures by state for 1930, 1940 and 1950 were analyzed with state per capita income and population density to estimate selected economic relationships for automobiles, a representative durable good. Automobile expenditures were composed of two major parts: (1) the depreciation or loss in value of the stock of cars held for the year; and (2) the expenses of operating and maintaining the stock of cars for the year. The income estimates used were the state income payments to individuals.

A study of the data revealed two significant groupings of the state automobile expenditures and income: (1) a smaller group consisting of the observations for the District of Columbia, New Jersey, Pennsylvania, Rhode Island, Massachusetts, Connecticut, Maryland, Delaware, and Illinois; and (2) the observations for all the other states

except New York. The smaller group spent a lower percent of income on automobiles than did the larger group. For both groups the percent of income devoted to automobile expenditures declined between 1940 and 1950 while total depreciation declined as a percent of automobile expenditures, and operating expenses increased as a percent of automobile expenditures. New-car depreciation greatly declined as a percent of automobile expenditures while used-car depreciation greatly increased between 1940 and 1950. Motor fuel was the single largest component of operating expenses and decreased both as a percent of operating expenses and of total automobile expenditures between 1940 and 1950. The other components of operating expenses showed increases as a percent of total automobile expenditures between 1940 and 1950.

Automobile expenditures were insensitive to income levels with the exception of expenditures on repairs and services, with total depreciation being more sensitive than operating expenses to income differences. The income sensitivity estimates for total depreciation were tested in a model for the demand for new cars and found to be valid within limits. The model for new-car demand related total depreciation to income and then projected this relationship to a future year. After an allowance had been made for the used-car depreciation in the future year, the residual value of total depreciation less used-car depreciation was used as an estimate of new-car depreciation. From this estimate of new-car depreciation, state estimates of new-car

purchases were made. The overall results were satisfactory, but several of the state estimates showed wide variations from the actual results.

Population density was found to be an important variable affecting the association between income and automobile expenditures. In general, the higher the population density the smaller the per capita expenditures on automobiles at any given income level. Part of this effect undoubtedly results from the introduction of better alternative methods of transportation and the problem of parking and driving in the high population density states.

The age of automobiles indicated no close relationship to income level in either 1940 or 1950, nor any strong consistency in the rank ordering by state between the years 1940 and 1950. The median age of automobiles registered in 1950 was almost double that of the automobiles registered in 1940 due in part to the reduced production of automobiles during the years 1942 to 1945.

The state observations of automobile expenditures and incomes have been combined statistically to estimate economic relationships. The methods used have proven satisfactory for their purposes. The results have been sufficiently encouraging to suggest that while further refinements of the data and the methods are required, further experimentation with the use of state data to estimate relationships is worthwhile.

Microfilm \$2.50; Xerox \$6.60. 139 pages.

THE MEASUREMENT OF POLISH INDUSTRIAL GROWTH: 1937, 1946-55.

(L. C. Card No. Mic 60-3)

Maurice Charles Ernst, Ph.D.
Columbia University, 1959

The principal purpose of this study is to develop a reliable basis for evaluating the growth of Polish industry during the post-war period through the year 1955 and also for estimating the degree and type of bias in the official index of Polish industrial production during this period.

At the heart of the study is a calculated index of Polish industrial production obtained by weighting indexes representing component categories of Polish industry by labor costs. Component indexes, in turn, are calculated from data on production in physical units weighted by prices. The commodity sample used in the index calculations comprises more than 200 series, whose total value is about 55 percent of the gross value of all industrial production in Poland. Two alternative base years are used: 1948, a year preceding the period of intensive industrialization, and 1955, the last year of Poland's Six-Year Plan of economic development. In order to facilitate the evaluation of post-war industrial growth, estimates are made of pre-war production in Poland's old boundaries and also in the new boundaries, taking into account the territories acquired from Germany and deducting those lost to the Soviet Union.

The system of weights used in the calculated index is believed to reflect very roughly the relative scarcities of goods and factors in Poland, according to the preference scale of Polish planners. The weights of the calculated index are approximations of the relative costs of the factor labor only, but alternative estimates of the growth of Polish industrial production obtained by adding imputed returns to

capital to labor cost weights were almost identical to those with labor cost weights alone.

According to the calculated index, Polish industrial production (including handicraft production) increased by approximately 84 percent from 1949 to 1955, at an average yearly rate of about 10.7 percent. Comparisons with pre-war are strongly affected by the change in Poland's boundaries as a result of World War II. The 1937 production level in the old boundaries was reached in 1947, and surpassed by 134 percent in 1955. But the 1936-38 level in the post-war boundaries of Poland was reached only in 1950-51.

During the entire period under study, the calculated measure of Poland's industrial growth is less than half of the official Polish measure. Rough estimates indicate that this very large difference is attributable to the following factors:

(1) Handicrafts were included in the official measure of production only as they were nationalized. This bias is particularly large in comparing pre-war to 1949, since the number of private handicrafts was being rapidly reduced during this period.

(2) The official index was calculated from data on gross value of production (with some additions, the value of sales) in all industrial enterprises in "fixed" prices (with some adjustments, 1937 prices). Not only did the use of a base year far in the past tend to create a larger measure of industrial growth than would have been obtained with a post-war base year, but the system of managerial incentives favored fulfillment of the plan for gross value of production at the expense of other plans. As a result of these incentives, product assortments were often selected which had the largest possible value in "fixed" prices for a given cost in current prices. Moreover, new products were often priced higher than would have been justified by the general rise in the price level from 1937, and there were probably also fraudulent increases in the "fixed" prices themselves in the process of making minor modifications of existing products. These factors probably caused most of the difference between the calculated and official indexes in 1950-55, and possibly a third of it in the earlier period.

(3) There were increases in the degree of industrial specialization. This raised the value of sales in relation to value added, especially between 1937 and 1949, more than offsetting increases in the degree of processing of industrial raw materials.

The rate of Polish industrial growth was much more rapid during the post-war period than during the inter-war period, and compares favorably to that of most West European countries since the war. In spite of large investments, however, a substantial part of the increase in production was achieved by pressing additional labor into existing plants. As a result, industrial employment grew rapidly, but productivity slowly, barely reaching pre-war levels (in the old boundaries) in 1955. It is probable that the marginal productivity of labor in a number of industries was extremely low by the end of the Six-Year Plan while at the same time, part of the new capital in other industries was unused. Thanks to the acquisition of large industrial assets in the ex-German territories, and to a high rate of investment forced by the Polish Communist government after the war, Poland had become, by 1955, a semi-industrialized nation, but industrialization proceeded at considerable cost in terms of the living standards of the population and with many inefficiencies, some of which were avoidable.

Microfilm \$5.75; Xerox \$20.50. 452 pages.

AN ANALYSIS OF STATE LABOR LAWS REGULATING TRADE UNION ACTIVITIES

(L. C. Card No. Mic 60-363)

Bevars DuPre Mabry, Ph.D.
Tulane University, 1959

Chairman: Howard W. Wissner

The study was concerned with the question: "What is the scope of state control, through legislation, of trade union activities?" In answering this question, four other questions also had to be answered. They were: (1) What state laws exist to regulate trade union activities? (2) How are these laws classified as to categories and types of states? (3) What is the subject matter of these laws? (4) How do laws of the same general type differ from one another? The purpose of the study was to present a comprehensive picture of the extent of state regulation of trade union activities by determining the extent of such laws, by properly classifying them, by analyzing their content, and by contrasting their substance.

Research for the study involved an extensive survey of the literature published since 1935 dealing specifically with trade union activities which have been subjected to regulation. The compiled statutes of each of the forty-eight states constituted the source of information for the state laws. These laws were briefed in detail to identify the substantive provisions contained within the laws. In addition, answers to specific questions were sought through correspondence with governmental agencies, state and federal, concerning the administration of labor relations laws. Almost all the agencies replied to these questions, and their replies provided an additional source of information.

The question of federal preemption in regulating the field of labor relations was first considered because this preemption has nullified or otherwise affected the applicability of state regulation in the field of labor relations. Next, some sixteen different types of laws were considered under the following five classifications: (1) laws pertaining to collective bargaining; (2) laws regulating the internal affairs of labor unions; (3) laws regulating labor disputes in public utilities; (4) mediation laws; and (5) laws regulating illegal acts committed in labor disputes.

Thirty-two states have laws which specify collective bargaining rights. Eleven states have comprehensive state labor relations acts, and six states have laws which provide certification procedures only for unions. Twenty states have enacted right-to-work laws, and twenty-five states restrict the use of the injunction in labor disputes. Unions may sue or be sued at common law as informal associations in all states, although only seventeen states have statutes which permit unions to sue or be sued. Two states have laws forbidding unions to sue or be sued. The anti-trust laws of seven states are definitely applicable to trade unions, and in seventeen states the anti-trust laws do not apply to labor organizations. The internal affairs of unions are regulated in one form or another in seventeen states, and union welfare funds have been regulated in six states. The fair employment practice acts of fifteen states apply to the membership admission policies of labor unions. Eighteen states have enacted laws designed to protect the public from the effects of labor disputes in public utilities. Mediation facilities, either permanent or tem-

porary, are provided in forty-five states. The conduct of strikes is regulated by laws of nineteen states, and laws regulating picketing are found in twenty-two states.

The study found that there were great variations in the types of laws found in the states regulating trade union activities. Since 1935 the number and types of laws have increased, and this increase has accompanied the growth in organized labor. The trend of these laws has been to place more restrictions on trade union activities. The trend apparently reflects the attempts of society to determine and to redefine the permissible limits of trade union activity. This reevaluation of permissible limits of union activities has been made necessary because of the increased size and power of organized labor. The study suggests that the degree of restrictiveness of the labor relations legislation of a state is inversely related to the degree of industrialization of the state.

Federal labor relations laws have significantly affected the enactment of state labor relations legislation. The Norris-LaGuardia Act (1932) and the National Labor Relations Act (1935) provided a stimulus to the enactment of state laws because of the positive effect of the federal laws on the growth of trade union membership and also because of the example set by the federal laws. The enactment of the Labor-Management Relations Act (1947) has tended to inhibit the enactment of state labor relations legislation, although state laws have been enacted in those areas where federal law permits state action and in those areas where the federal government has not yet assumed exclusive jurisdiction. Federal law in the future can be expected to increase in importance in the regulation of trade union activities, and state legislation can be expected to diminish in importance.

Microfilm \$7.20; Xerox \$25.65. 567 pages.

SOME PROBLEMS IN EXTENDING FEDERAL MILK ORDER REGULATION IN MICHIGAN

(L. C. Card No. Mic 60-541)

Stanton Putney Parry, Ph.D.
Michigan State University, 1958

Major Professor: Gerald G. Quackenbush

This thesis has considered some of the basic order provisions needed in case of Federal milk marketing regulation for the entire Lower Peninsula of Michigan. The provisions considered were as follows:

1. Delineation of the marketing area and the number of orders to effectuate regulation in the Lower Peninsula of Michigan.
2. Construction of classes of use.
3. Analysis of transportation differentials.
4. Consideration of a seasonal price plan.
5. Type of pooling arrangement and pool plant requirements.

It was hypothesized that these outlined provisions would need revision in moving from the present regulated and unregulated territory in Michigan to an expanded and

merged order or orders embracing the entire Lower Peninsula of Michigan. In general, the following procedure was used in reviewing each provision:

1. The problem in each case was defined.
2. Criteria were erected for a theoretical framework in which to develop the analysis.
3. Finally, the criteria were analyzed to arrive at what was believed to be the best alternative provision for inclusion as part of the Lower Peninsula order.

One of the difficulties encountered in the analysis was the conflicts of interest between consumers, dealers, and producers. Also two types of problems were considered, one dealing with equity and one dealing with efficiency. These conflicts and the problems of equity were difficult to overcome, but inasmuch as possible definite recommendations were made in the light of the best available information, and with some commonly accepted equity objectives in mind. The recommendations were as follows:

The Market Area

It was recommended, on the basis of eight examined criteria, that there should be one order for the entire Lower Peninsula.

The Classification System

It was recommended that milk be classified in two use classes. This was based largely on the inspection requirements actually enforced on the major Lower Peninsula markets.

Transport Differentials

The best alternative transport differential system for the Lower Peninsula order appeared to be the f. o. b. price at Detroit less transfer cost to other zones set up by airline miles in the state. This appeared to approach the "perfect market" concept and provided for a decrease in price toward the Wisconsin large surplus area and the "Thumb" small surplus areas.

Seasonal Price Plan, Type of Pool and Pool Plant Requirement

The seasonal price plan recommended for the Lower Peninsula is the base and excess plan largely due to its effectiveness and prior acceptance in the state.

A market wide pool was recommended since it appeared to be the most equitable alternative.

Pool plant requirements were set up requiring minimum sales in the area and a specified percent of producer receipts delivered on routes to qualify a distributing plant as a pool plant or delivered to a distributing plant in the market area to qualify a supply plant as a pool plant under the order. This was considered necessary for proper functioning of the classified price system under the order.

Microfilm \$3.20; Xerox \$11.05. 245 pages.

TERMS OF TRADE AND ECONOMIC DEVELOPMENT

(L. C. Card No. Mic 59-5213)

Emile Eugene Quevrin, Ph.D.
Princeton University, 1959

There is a rather puzzling paradox in the economic literature on the terms of trade and their secular trends. On the one hand, it has been claimed that, at the beginning of the twentieth century, industrial countries were experiencing a fall in the quantity of raw products which a unit of their manufactured products could purchase. This hypothesis which was proposed by J. M. Keynes found new supporters in the 40's in Colin Clark and Fourastie. However, their underlying explanations were quite different from Keynes'. On the other hand, in more recent years, Prebisch began to claim that underdeveloped countries were suffering a severe fall in their long run terms of trade. This fall prevented the underdeveloped countries from obtaining their share of the advantages flowing from improved productivity and constitutes a serious obstacle to their economic development.

The first part of this thesis describes at some length the various points of view. The description shows that by defining concepts clearly much of the obscurity in these controversies can be made to disappear. But at the same time it shows clearly that the writers in question really changed their positions. Moreover, the factual basis of their arguments generally appears as very weak, as do many of their basic explanations.

But what empirical materials should then be required to settle this question? These requirements are outlined in the second part of this thesis. However difficult it may be to meet them, they give thorough standards by which the relevance of the statistical series can be evaluated.

As the case of Great Britain played an important role in most of the discussions, Part III is devoted to an analysis of the more relevant factors involved in the evaluation of its terms of trade. After a few remarks on economic development, the structure of British foreign trade is surveyed and this leads the way to an examination of the contribution of technical progress to the gains from trade. Finally, an attempt is made at assessing the respective roles of prices and productivity in British economic development and its relation with foreign trade.

After the analysis of the British case, there follows a survey of the evaluation of terms of trade of several countries. Three groups of countries are therefore examined: European industrial countries; recently developed countries (New Zealand, Canada, South Africa, Australia and Japan) and countries which are still underdeveloped (India, China, Brazil, Egypt and Belgian Congo). A country by country analysis brings to light the great variety of economic and sociological factors which play an active role in determining the course of the terms of trade.

The analysis of the factual material as well as of the theory leads to the conclusion that the diversity of demand and supply conditions, as well as the diversity of external exchange structures, does not warrant generalization as to the terms of trade of groups of countries.

Microfilm \$3.85; Xerox \$13.00. 297 pages.

CURRENCY REFORM AND RECONSTRUCTION OF THE WEST-GERMAN ECONOMY, 1948-1949.

(L. C. Card No. Mic 60-695)

Ruth Helene Reinsch, Ph.D.
University of Kentucky, 1950

No event since the capitulation of the German armies has had such an impact upon every sector of German life as the currency reform and its companion measures in West-Germany. Overnight the financial and commercial life of tens of millions of persons was transformed, and an economy with legal and functioning markets came into existence.

Before the reform, Germany faced the danger of repudiation of the Reichsmark currency, and of complete disintegration into a number of localized barter economies. The cause of this situation was the disproportion between the monetary super-structure and the economic foundation which had developed during the years of war preparation, the war itself, and finally defeat.

Germany faced a dangerous inflation at the end of the war. To prevent a runaway inflation, the four-power Military Government took over the wartime system of rigidly controlled prices and wages, and of consumer rationing. The "suppressed" inflation, however, obstructed any efforts toward industrial recovery.

The substantial recovery of the West-German economy, and the success of the currency contraction measures was apparent in the rapid increase in industrial production after the reform. Also, in the field of foreign trade, the volume of imports and exports improved, and a better share of manufactured products in total exports was achieved. Altogether, with the establishment of legal markets and sound financial conditions, the West-German economy could once more prove its ability to produce and consume, and it did so with marked success. With the return to rational economic organization, however, the main structural weaknesses of the West-German economy became apparent. First, capital formation and the level of investment were not sufficient to insure full employment, and furthermore, the West-German economy still rests on the props of American aid, since roughly one-half of total imports was not paid for in 1948. If West-Germany is to achieve a balanced current account by 1952, it will have to increase its exports by approximately two and a half times, and this increase must be accompanied by an increase in the total output of at least the same amount. It is difficult to see now, how this target can possibly be reached by the time Marshall Plan aid is scheduled to end.

Aside from the long run difficulties, however, the currency reform and its companion measures have successfully solved the problem of providing a sound financial basis for the West-German economy, and of establishing legal markets. Generally, the reform has been criticised on two accounts: for being socially unjust and for having provided "too much money." As complete social justice is impossible to achieve, the reform should not be criticised too harshly on that account. The period of inflation, however, was a matter of more serious economic and social consequences. But it facilitated the difficult period of readjustment, and prevented a sudden increase in unemployment and numerous firm breakdowns. Thus, it had also some beneficial effects. Altogether, currency reform re-

stored a viable West-German economy, and gave its people a new lease on life.

Microfilm \$4.30; Xerox \$15.10. 333 pages.

REGIONAL ECONOMIC ANALYSIS AND SOCIAL ACCOUNTS: AN INTERINDUSTRY APPLICATION.

(L. C. Card No. Mic 60-45)

Sidney Sonenblum, Ph.D.
Columbia University, 1959

This report applies the theory and practice of social accounting systems to regional economic analysis.

It contains a short discussion of the development and nature of the four main national social accounting systems - income and product, moneyflows, interindustry, and wealth accounts. It discusses the theoretical and statistical adaptation of these accounts to regional analyses. It includes a discussion of the nature of regional problems and how their solution can be aided with the use of social - particularly interindustry - accounts.

Both interindustry and income and product accounts are developed for the Kalamazoo County, Michigan economy of 1954. The main focus is on the interindustry account or local accounts table.

The local accounts table is constructed from primary local data, as developed from a local survey, and supplemental published data where it was necessary. A complete description of the construction of the local accounts table is provided in the report.

The local economy is divided into 35 sectors including local households, government, and 33 business sectors. The 1954 values of purchase and sales transactions among these local sectors are shown; in addition the "export" and "import" transactions between these local sectors and 59 non-local sectors are shown. The non-local sectors include national households, non-local governments, one foreign country sector, and 56 national business sectors.

The local accounts table is used to measure the effects, on local household incomes and local industry outputs, of such impacts as sales to specific non-local sectors and purchases from non-local sectors. Such a table is particularly useful for measuring the indirect or complementary effects, on local sectors, which are generated through the various interindustry sales in the local economy. For this purpose a local inverse table is necessary and was calculated.

Measurement of the income and output effects of the various local and non-local industries allows local interests and decision makers to identify the internal and external economic forces which are important to community affairs; and to gauge the relative importance of each sector to local goals and aspirations.

The report also uses the local accounts table as a statistical tool for projecting local economic activity. The 1954 economy is projected to 1960 under four different alternatives which are deemed reasonable. The assumptions and implications of these alternatives are examined to assess the effects of various policy decisions on local economic activity and to predict possible bottlenecks to expanded activity.

Although policy recommendations for Kalamazoo might be implicit in the calculations they were not made for this purpose. Their primary purpose was to demonstrate the application and utility of the local accounts to regional economic analyses.

It is the conclusion of the report that local interindustry accounts are a useful additional tool for the analysis of the regional problems; that such accounts can be constructed and kept up to date at a reasonable cost in research time and funds by combining primary and secondary data sources; that further research into the theoretical and statistical foundations of accounting systems adapted to regional analysis is necessary; and that such local studies will improve our national accounting systems.

Microfilm \$3.85; Xerox \$13.50. 299 pages.

THE PREMIUM PRICE PLAN FOR COPPER, LEAD, AND ZINC.

(L. C. Card No. Mic 60-55)

Roger John Williams, Jr., Ph.D.
Columbia University, 1959

The purpose of this study is to evaluate the World War Two subsidy for copper, lead, and zinc mine production. Under the plan, production within historically based production quotas sold for only the ceiling price, while premiums were paid for above quota production. This was an attempted combination of production incentive and wartime profit limitation.

Evaluation has been made according to: (1) production incentive, (2) consumption control, (3) administration and compliance, (4) stabilization, and (5) miscellaneous ethical and political considerations, with major ethical value being attached to production incentive by this author. Four major alternative arrangements have been considered. These are: (1) the actual premium price plan, (2) higher price ceilings, (3) a flat rate subsidy on all production, and (4) a revised premium price plan. Empirical testing has been used wherever possible, but various difficulties have forced the use of interviewing and qualitative reasoning.

The principal findings may be summarized as follows. Available prewar data suggests that domestic mine production was not a fertile field for wartime expansion, and that expansion of imports, increased recovery of scrap, and consumption restrictions should have been more fully explored. Chapter Three delineates the misguided way in which import and domestic production objectives were set. It was noted that the program shifted rapidly away from its initial conception of production expansion to production maintenance, and that the end of the war brought further drastic changes.

Chapter Four presents the initial pattern of production inducements, with emphasis on the problem of unequal marginal revenue incentives. The inadequate integration of premium pricing with excess profits taxation is also mentioned.

Following this comes an account of incentive structure over time. The incentive repercussions of quota revision bargaining are here scrutinized, and it is concluded that higher price ceilings would have been the best method for

adjusting to change. Consideration is also given to the possibility that higher grade ores were saved for post-plan use. For a variety of reasons, it is concluded that such postponement of production was not widespread.

After discussion of difficulties in administration and consumption control, an attempt is made to explain the considerable drop in production and the noticeable rise in total average price which occurred during the war. Although metal production per man hour in general increased during the war, it is believed that the incentive structure of the plan prevented still further increases. The decline of wartime metal production was proximately associated with a reduction in mine labor force, but this in turn was attributed to the profit and wage limitation implicit in the scheme.

The stabilization and profit control arguments for premium pricing, such as the danger of pyramiding, were found to be rather weak. The alleged "savings" were in large part achieved at the expense of lower production. It was also noted that the excess profits tax was a much superior device for profit control.

Supporters of the plan inadequately understood the nature of profits as production incentives, and they discounted too heavily the potential effectiveness of taxation in recovering "excess profits." They also placed too high a wartime ethical value on matters of income distribution, as contrasted with production. Proponents of the scheme were afraid of the relative price mechanism for controlling production and consumption of metals. The cumbersome procedures and the individual case method actually used in direct administrative determinations were serious deficiencies in the operation of the program. For numerous substantial reasons, it is concluded that higher (but not unlimited) metal price ceilings were the best method for increasing production and restraining consumption of metals.

Microfilm \$2.90; Xerox \$10.15. 224 pages.

ECONOMICS, AGRICULTURAL

A NON-STATIC MODEL OF THE BEEF AND PORK ECONOMY

(L. C. Card No. Mic 60-571)

Wayne Arthur Fuller, Ph.D.
Iowa State University of Science and Technology, 1959

Supervisor: Dr. Geoffrey Shepherd

Equations were designed and estimated statistically from post war quarterly data in an attempt to explain the behavior of consumer demand, retail margins, wholesale margins and cold storage stocks for beef and pork. Lags were included in the equations to obtain information on the nature of time reactions at the various levels of the marketing channel. The lag models were primarily of the Koych-Nerlove type. A simple expectational model was fitted to the storage data. Dummy variables were introduced into the analysis in a manner which allowed both the slope and the intercept values of the equations to vary by quarters.

In general lags were important at all levels of the pork and beef economy except for consumer demand in which case the evidence was inconclusive. The inclusion of the lagged dependent variable significantly improved the predictive ability of most of the equations. Caution is necessary, however, in interpreting the regression coefficients of these variables as structural coefficients since the presence of autocorrelation in the errors may seriously bias the coefficients. Tests for autocorrelation performed upon the residuals generally yielded non-significant test values. Unfortunately these tests are not precise when lagged endogenous variables are included among the explanatory variables and there is reason to believe that the tests are biased toward non-significance.

The consumer demand equations yielded results which were generally compatible with the results of yearly studies. Only a moderate proportion of the total variation in wholesale and retail margins was explained by the regressions. In the neighborhood of 60 per cent of the variation other than seasonal variation was explained by the regressions and in all cases at least one variable other than the lagged endogenous variable was significantly different from zero. The storage equations derived from the expectational model explained between 75 and 90 per cent of the variation, other than seasonal, in the quarterly change of stocks.

Microfilm \$2.50; Xerox \$5.80. 120 pages.

A CONCEPTUAL STUDY OF THE FARM AND HOME DEVELOPMENT PROGRAM

(L. C. Card No. Mic 60-685)

Clisby Carey Moxley, Ph.D.
University of Kentucky, 1955

An attempt has been made in this study to clarify some of the stated and implied objectives of both farm families and the Extension Service. Implications of declared objectives of the two groups are not always in harmony. For example, maximum production does not mean optimum production and maximum efficiency in resource use does not necessarily lead to the maximization of welfare.

Investigation of decision-making based upon expectations involved study of nature of desires for both economic and non-economic goods that are produced and/or consumed both in the present and in the future. These desires, along with expectations and risk preferences or aversions, are incorporated in the family's system of values and time preference patterns. Close examination of these factors gives an indication of the manner in which firm-household conflicts may influence plans and actions.

A study of the manner in which firms and households plan and act as they move through time involved an inquiry into interrelationships between the family's highly subjective time preference patterns and the production possibilities facing the family. The optimum allocation of income between present consumption and capital accumulation depends on both the family's time indifference surface and the time production opportunities. Indifference contours were superimposed upon curves representing time production possibilities in order to show that points of tangency represent optimum use of resources in terms of family satisfactions and that, for a given set of produc-

tion opportunities welfare is increased by any reallocation of resources that results in movement toward the point of contact with an indifference curve representing a higher level of satisfaction.

An extension program aimed at teaching families farm and home planning must, if it is to be of optimum service, use teaching methods, materials, and procedures that are adapted to the particular group of families involved. Likewise, publicity designed to encourage family participation should be kept realistically in conformity with the interests of the particular groups toward which it is directed. Planning should be approached with consideration for both monetary and psychic income, with the realization that the relevant probabilities are unknown and that experience, as well as conditions, changes in the course of action itself, thus leading to a continual need for change in plans.

This study has suggested many areas in which research is urgently needed. In addition to specific problems described in relation to needed information for work in the farm and home development approach, there are many more general problem areas. More information is needed on the differential acceptance of new farming methods by families in relation to sociocultural systems, socioeconomic status, and family value systems. Research is needed to determine more precisely the extent to which acceptance of innovations is related to different motivating factors such as desires for social recognition, security, leisure, or comfort, and the extent to which economic factors influence family decisions as compared to non-economic considerations. Further research will be needed to determine the extent enterprise selection should be based on a farmer's comparative advantage or on his subjective preference, whether absolute price changes or relative price changes are more important factors in decision making, how decisions are affected by tenure, indebtedness, and the prevalence of enterprise specialization, and the cause of under-investment. A need exists for more information on the relationship between size of operation and the degree to which resources are allocated in response to price. Satisfactory solutions to these and related problems are more likely to be found through greater flexibility in research programs, more cooperation among scientists in all related fields, and by research workers being encouraged to exercise more freedom of thought and action.

Microfilm \$2.50; Xerox \$8.00. 175 pages.

AN ANALYSIS OF CHANGES IN CONSUMER MILK PURCHASES IN TWO OHIO METROPOLITAN AREAS

(L. C. Card No. Mic 60-786)

Ronald Howard Pollock, Ph.D.
The Ohio State University, 1959

Milk purchases per capita within individual households in two Ohio markets changed considerably from 1955 to 1958 despite the fact that the total milk consumption of the sample group of households did not change from one period to the other in either area. This study is an analysis of the effects of changes in some economic factors on milk purchases within households. Characteristics of individual households relative to income, the number of persons,

their ages, and milk purchasing attitudes and behavior were obtained by telephone interviews with approximately three hundred households in each of two Ohio metropolitan areas, Cleveland and Dayton, in 1958. Comparative data for each household was available from a previous study completed in 1955. In addition, another survey of three hundred households was completed in Dayton as a check of the reliability of the previous two samples.

Changes in household size did not affect per capita milk purchases. Little influence of changes in household income on per capita consumption was indicated except for households in which the income decreased. In these households per capita purchases tended to decrease. A positive relationship was found between shifts in total milk purchases of households and their per capita purchases.

The trend in source of purchase in both markets was from home delivery to the store since milk could be purchased from a store at a lower price per quart. However, the lower price paid for milk did not result in increased purchases as might be expected. The use of multiple quart containers had increased in both cities from 1955 to 1958. Consumers seemed to use the container size of those available which best met their needs. Within the limits of the study it appeared that milk is a highly inelastic commodity with respect to both price and household income. Changes in household milk purchases from 1955 to 1958 were strongly related to non-economic factors, such as special diets, variations in attitudes toward nutritional needs for milk, differing levels of milk consumption by family members, and other more nebulous factors. This was ascertained from a mail survey of all households in which the 1958 per capita purchase was greater or less than the 1955 per capita purchase by one-half pint or more per day. Microfilm \$2.50; Xerox \$7.80. 169 pages.

ECONOMIC CONSIDERATIONS OF GRAIN-ROUGHAGE SUBSTITUTION IN FEEDING FOR MILK PRODUCTION

(L. C. Card No. Mic 60-694)

John C. Redman, Ph.D.
University of Kentucky, 1951

Supervisor: Glenn L. Johnson

This study translated the usually accepted feeding recommendations for milk production into an economic framework. Certain inconsistencies appeared when these recommendations were compared with some published experimental data and the economist's model of production relationships. Experimental findings and other information were used to synthesize quantitative production data.

Dairy farmers face various problems associated with milk production. The quantity of milk produced is determined by variables such as breed, quality, feed, management, etc., of which the principal one in the short-run planning period is the quantity of feed fed, as the influence of other variables is not registered quickly. Thus, it is important to consider feed as the important variable in adjusting to price changes. The guides available to the dairy farmer are (1) feeding standards which ignore the law of diminishing returns and (2) the work by Jensen, *et al.*, and associated reports which omit the problem of substitution among feeds.

To achieve an adequate and yet economical feeding of dairy cows, the farmer among other tasks must choose, apportion and combine inputs in such a way that the marginal value products of all inputs are equal to their respective prices in all uses. This study dealt with the problem of determining the optimum combination of grain and roughage to secure a given output of milk. Also, the study was concerned with the nature of stomach capacity line and the optimum quantity of feed to feed under a particular milk-feed price relationship.

Concepts from static theory of the firm, along with logic, were used as the basis to select and synthesize empirical data defining the relationships. The variance in usually suggested maintenance requirements was probably due to different combinations of feed used which were supported by the work of Beach. The usually accepted feeding standards imply a linear relationship between TDN and milk produced and between TDN from various sources. Under these assumptions farmers would feed unlimited quantities of all hay or all grain, depending on which is cheaper. With all-hay feeding practice, the stomach capacity will set the quantity of hay used. If an increase in milk is expected, additional TDN can be fed in the form of grain, resulting in some reduction of hay to make room for grain. The expansion path in this case will be along the roughage axis and then along the stomach capacity line. Under the usual feeding recommendations, milk is still a linear function of TDN regardless of source.

Many studies indicate a diminishing marginal rate of substitution of hay for grain, and vice versa, instead of a constant rate. Also, studies indicate a diminishing return to feed fed and not a linear relationship.

Empirical information was used to approximate a logically consistent function for a 1200-pound cow capable of giving 9000 pounds of 4 per cent of fat-corrected milk when fed a grain-milk ratio of 1:4 and all the medium quality roughage that can be consumed. A second function was approximated for a lower quality cow giving 6000 pounds of 4 per cent milk under similar conditions. The shape of the contours, stomach capacity line and the response of milk to changes in quantity of different combinations of feed were also approximated.

Different hay-grain price relationships were used to determine the optimum combination of hay and grain. Then, various milk-feed prices were used to determine the optimum level of feeding. This study should aid in the development of more practical and logically correct feeding standards.

Efforts are made to conserve soil with the resulting increase in forage production. If the expansion path already coincides with the stomach capacity line for forage, substitution possibilities are limited.

Microfilm \$2.50; Xerox \$8.80. 192 pages.

ECONOMICS, COMMERCE - BUSINESS

THE STATUS OF THE ACCOUNTING
PROFESSION IN THE SOUTH

(L. C. Card No. Mic 60-275)

Paul Wayne Burnam, Ph.D.
University of Alabama, 1959

A profession is characterized by the possession of an intellectual technique, acquired by special training, which can be applied to some sphere of everyday life. The criteria by which a profession can be measured are: a body of specialized knowledge, an educational process, qualifications for admission, standards of conduct, formal recognition, acceptance of social responsibilities and an organization devoted to the advancement of the social obligation.

The development of a body of specialized knowledge in accounting can be traced to a very early beginning. The City States of Italy contributed the first important writings on bookkeeping. The earliest dates of these writings were in the fifteenth century. Each country in Europe made a contribution to this body of knowledge. England was the site of many advances in the early recognition of the importance of accounting.

The South contributed little to the development of a body of specialized accounting knowledge. The early businesses adopted the examples of accounting techniques in use at this period in history. A profession of accountants did not develop until passage of legislation during the early part of the present century. The South was not first in the adoption of legislation governing accounting, neither was it last. New York passed the first law. The date of this law was 1896. Within the next quarter century all southern states had adopted similar legislation.

An educational process for training those seeking admission to a profession is a necessary part of professional growth. The South has developed its own educational system. Training is available at the undergraduate and graduate level. Special review programs are available.

Certified Public Accountants in the South are practicing accounting as individual practitioners, as members of small partnerships and as members of large national firms. The growth in number and size of firms has paralleled the economic growth in the area.

Southern accountants have recognized the importance of professional organizations. Percentage of membership in national and state societies is high for southern states. In many instances southern states lead the nation in percentage of membership.

The demand for accounting services in the South is created by state and federal legislation. Income taxes, social security legislation, sales taxes and securities and exchange regulations have brought about a need for additional accounting records. This has stimulated the growth of the accounting profession.

The supply of accountants in the South has increased rapidly to meet the additional demand. The type legislation adopted in most states permits the movement from one state to another through the use of reciprocal certificates. The educational system in the South has furnished an ever-growing supply of trained college graduates.

Financial rewards for accountants has kept pace with the changing economy of the nation. Opportunities exist for making incomes comparable with other professional men.

Interest in the social obligations of a profession has occupied the interest of southern accountants. Many Certified Public Accountants have served in the state and federal government, performing valuable services.

The status of the accounting profession in the South compares favorably with that which exists anywhere in the United States. The South has made valuable contributions to the growth of the profession.

Microfilm \$3.45; Xerox \$11.80. 268 pages.

MEASUREMENT OF PROFIT PERFORMANCE
OF DECENTRALIZED DIVISIONS

(L. C. Card No. Mic 60-4)

Paul Francis Fagan, Ph.D.
Columbia University, 1959

Growth in the size of the firm creates difficult problems of managerial control and coordination. Former methods of organizing and controlling have become obsolete. New methods have been required to maintain the firm's competitive strength.

One of the new methods that has been used is to reorganize the enterprise along decentralized lines with each division becoming a relatively autonomous unit. With the broader scope of decision-making powers of divisional management there is an increased need for better control devices. The use of divisional profit measurements has been an important development in this regard.

This dissertation involved the collection and analysis of data relating to divisional profit measurements and the role played by them in the internal control process. The primary source of data was interviews with executives of twenty companies. Three types of individuals -- the measurer (controller), the measured (a divisional executive), and the manager (vice president in charge of operations) -- were normally interviewed. The following types of information were sought:

1. The profit concepts currently used in controlling divisional operations and the major changes in the concept during the past ten years.
2. The procedures currently used in developing divisional profit plans and the major changes in the procedures during the past ten years.
3. The problems of interpreting divisional profit plans.
4. The use of profit data in the compensation of divisional executives.
5. The motivational effect the measurement system has on divisional executives.
6. The features of the system which cause the greatest amount of friction.

The data collected through the interviewing program together with the published literature on the subject provided the basis for (a) the definition of the major issues involved in the use of divisional profit in evaluating performance, and (b) insights into these issues by an analysis of the data.

The main body of the dissertation is organized in the

following manner: Chapter 2 is concerned with profit concepts and the problems of setting targets. Performance areas other than profit, which are considered significant determinants of long-term survival are also discussed. Chapter 3 is devoted to the various issues involved in measuring profits. The problems of evaluating the measurements and the use of the measurements are discussed in Chapter 4. The final chapter sets forth the conclusions and a suggested method of appraising internal control systems.

This study indicates that profit measurements have an important place in the control of decentralized divisions. However, there are several problems in its use. The use of profit measurements in control is related, of course, to the kinds of standards employed. Current practice favors the adaptation of profit targets to compensate for any deficiencies in the accounting building blocks used for other purposes. Thus, the key to effective use of profit as a control instrument depends on the ability to set good targets. And setting good targets presents many problems which have only been partially solved.

Although profit may be a good control point, other dimensions of performance must be evaluated in the control process because of the inability of profit to reflect quickly the effects of expenditures for intangible assets. The problem, then, is to select these other dimensions of performance, and to devise instruments for their measurement. In the writer's opinion, many problems remain unsolved in this area.

Microfilm \$2.50; Xerox \$6.20. 127 pages.

SOME ASPECTS OF OVERHEAD ACCOUNTING FOR INCOME MEASUREMENT AND COST CONTROL

(L. C. Card No. Mic 60-548)

William Leonard Ferrara, Ph.D.
Michigan State University, 1959

Major Professor: B. C. Lemke

The income measurement and cost control aspects of accounting for manufacturing overhead costs have yet to be fully developed. Concepts applicable only to other cost finding purposes have been adopted for income measurement. Control of manufacturing overhead costs is viewed as proceeding from ex post analyses of the variances of standard costing and flexible budgeting.

Costing concepts historically developed for sales price determination and cost control have been accepted with little, if any, modification for income measurement. The normal capacity concept and the idea that unit costs should not be allowed to fluctuate with volume are remnants of the early emphasis on price determination and cost control.

Use of the normal capacity concept brought forth the direct costing controversy. Attempts to defend traditional accounting on the basis of a cycle capacity concept or a practical capacity concept failed to recognize the inherent limitations of all three capacity concepts when they are used to measure income.

To measure income properly, overhead should be categorized and allocated as follows:

Category	Bases of Allocation
Costs applicable to fixed assets (depreciation, insurance and taxes)	Units of production or an approximation thereto which is the cycle capacity concept
Indivisible costs inputs or chunk costs (the semi-variable costs which are absolutely necessary for all outputs within a range of outputs)	Actual output
Other overhead costs (primarily the costs to operate fixed assets)	Actual output

The unit of production basis for allocating fixed asset costs is the only basis consistent with the expected use (useful life) of fixed assets. Allocation of "chunk costs" on the basis of actual output is the only method consistent with the fact that "chunk costs" are absolutely necessary costs for any output within the range that "chunk costs" can serve. On the above bases unit costs may vary with volume and the generally assumed utility of a fixed-variable breakdown for cost allocation is rejected.

Within the realm of cost control the fact that many out-of-line conditions can and will be eliminated long before variances are accumulated must be recognized. Control of overhead costs starts with preventive cost control, continues with visual observation and ends with variance accumulations. Preventive cost control attempts to stop waste before it starts. Visual observation by workers and supervisors stops waste before it starts or as soon as it is detected. Variance accumulations detect wastes which have evaded visual observation and show the profit impact of waste.

The traditional approach to cost control is ex post in that variances are analyzed to determine root causes which must be eliminated. Such analyses are not only too late for truly effective cost control, their approach is entirely inappropriate for they ask the question, what must we do now? (after we find out what went wrong). The only question consistent with the residual position of variance reports is what has already been done? to eliminate the causes of out-of-line performance.

Microfilm \$5.60; Xerox \$19.80. 440 pages.

HISTORY OF RETAIL CREDIT COMPANY: A STUDY IN THE MARKETING OF INFORMATION ABOUT INDIVIDUALS.

(L. C. Card No. Mic 60-737)

William Adams Flinn, Ph.D.
The Ohio State University, 1959

The Retail Credit Company in sixty years has become a successful international firm engaged in the marketing of information about individuals. In every year but six its annual sales have increased and the scope of its activities has continuously broadened, yet it is not well known to the business community at large. The purpose of the study was to introduce an important economic institution to the business and professional fraternity, document the

company's development, define the nature and scope of its activities, delineate its market and establish the economic justification for its services. An effort was made, also, to explain the firm's unusual record of growth in a field traditionally typified by small-scale enterprise.

The method of approach was primarily historical. Sources regarding the inspection of individuals are relatively few, difficult to tap, and limited in detailed data available. Primary research was restricted largely to the records of the Retail Credit Company. The evolution of the organization and systems required for producing and marketing specialized data on individuals were described and the principles underlying the firm's strong marketing position were developed. The origins of two areas of activity toward which its services have been principally oriented - credit granting and insurance underwriting - were explored, mainly through secondary sources, in order to ascertain the factors that create demand for the types of information furnished.

The study contributes to business and marketing knowledge by (1) presenting the first comprehensive and authentic analysis of that specialized field of service which regularly provides information on individuals for business purposes; (2) classifying personal hazards and identifying the variety of information required by business for effectively reducing risks imposed thereby; (3) supplying valid evidence supporting the primacy of the service objective; and (4) detailing significant stages in the evolution of a successful firm, thereby illustrating

- a) the need for early establishment of long range objectives and judicious timing in their implementation;
- b) the desirability of adhering to established policies and systematic procedures;
- c) the importance of its organization to a service business and the benefits of good selection, training and motivation of personnel;
- d) the rewards of consistently fair dealings between owners, customers, employees and the public;
- e) the effectiveness with which selective methods of sales promotion and advertising can be practiced with a limited expenditure of funds;
- f) the necessity for continuous research to determine customer needs and to anticipate changes in demand by adaptation and innovation;
- g) the importance of standardization and quality control in the marketing of a service.

Results of the investigation indicate that information about individuals offers material aid in the reduction of risk arising from personal hazard as distinguished from universal and social hazard. Each of the five sub-classifications of personal hazard defined in the study calls for its own special combination of facts, depending on the purpose of the investigation.

Along with increasing economic interdependence, the need for pertinent and reliable personal information, both quantitative and qualitative, becomes more urgent. The Retail Credit Company has built successfully on this need, aided partly by time and circumstance, but more importantly by the vision, initiative and management policies of its executive group, and by the early application of basic principles of the marketing concept.

Microfilm \$4.90; Xerox \$17.35. 381 pages.

MANAGERIAL CONTROLS IN AN INDUSTRIAL-TYPE MILITARY INSTALLATION

(L. C. Card No. Mic 60-437)

Richard M. Hurst, Ph.D.
Northwestern University, 1959

As enterprises increase in size there appears something akin to a geometric increase in the complexities of application of managerial principles to organizational practice. These principles are rather well documented in the contemporary literature of management; the problems on which these principles should be brought to bear are normally present in great profusion. It is the mechanics of relating one to the other that usually challenges the ingenuity of management. The maze of interrelationships requires the careful identification and classification of the problem or task elements themselves. Likewise, there is required a careful identification and classification of the managerial devices or techniques which are appropriate to problem resolution or task accomplishment in order that these devices can be assembled in an orderly array for managerial use.

This requirement, perhaps even more than in the average industrial firm, is critical within an industrial-type military installation such as Watertown Arsenal, an Army Ordnance plant located at Watertown, Massachusetts. This circumstance derives from the fact that the arsenal work force is subject to extremely rapid expansion and contraction and the arsenal management is subject to frequent change of key officers because of normal movements of military personnel. These conditions require a well-defined system of managerial controls; the identification of these controls and the determination of the manner and extent of their use are matters requiring investigation.

Industrial experience, as reflected in management literature, provides for the classification of managerial controls into two broad categories, namely; administrative controls and operative controls. These categories are not mutually exclusive, but provide useful groupings for the purpose of determining levels of managerial interest and methods of application to organizational practice. Administrative controls include: organization, programs and projects, policy, procedure, inspection, and reports. Operative controls are so numerous as to defy listing, but include such controls as: production control, inventory control, expenditure control, maintenance control, manpower control.

All of the administrative controls, listed above, are present in the industrial-type military installation plus an additional one somewhat uniquely of military interest, i.e., mission. The operative controls found in industry are also present within the military plant, but are difficult to identify because they are so numerous, so interlaced, and so omnipresent. However, such identification is facilitated by the establishment of an operative control framework which provides for the determination of a pattern of controls, the codification of all control factors, and the recording in detail of all elements of control in such a manner that retrieval of information for a variety of organizational purposes is facilitated. The bits of information which must be identified, recorded, and kept under continuing surveillance are so great in number as to indicate that effective handling can be accomplished only through the use of automatic or electronic data processing equipment.

The full exploitation of the use of administrative and operative controls, respectively, provide prospect for:

- a. the creation and maintenance by top management of an environment in which all managerial personnel make decisions and act with confidence, enthusiasm, foresight, and purpose; and
 - b. the elimination of uncertainty among responsible operating personnel as to the scopes of authority which they exercise (and thus the attainment of a great measure of "built-in" control); and the providing of a means whereby rapid expansion of the work force can be accommodated (when required) by the "push button" preparation of procedures, job descriptions, and related control instruments.
- Microfilm \$3.50; Xerox \$12.15. 269 pages.

AN ANALYSIS AND INTERPRETATION OF
THE FACTORS INFLUENCING THE
DECENTRALIZATION OF THE DOWNTOWN
DEPARTMENT STORES IN ST. LOUIS

(L. C. Card No. Mic 60-341)

Roy Arthur Klages, Ph.D.
St. Louis University, 1959

The establishment of suburban outlets by the primary retailing institutions in metropolitan areas has been one of the major movements in the first phase of the marketing revolution. This movement has altered radically the merchandising practices of department stores and their competitors in keeping abreast of the changing shopping habits of consumers. While desirable documentary statistical and accounting data are not available, the progress made is such that the movement may be critically evaluated qualitatively in its two principal aspects, establishment and operations, particularly on a city-by-city basis.

This dissertation is such an analysis--an interpretation of the significant developments which created an opportunity for the branch store developments, of the subsequent operations of each downtown store in relation to its branch unit or units, and of the decision making process in relation to the expansion of the major department stores in downtown St. Louis. Data are presented to answer the following major questions: What were the economic factors that created the opportunity for branch store development? What were the specific market conditions that prompted department store executives to consider the branch store as a method of expansion? In what respect did the forces influencing national branch store development parallel local development? In what way were decisions to establish branch units made?

Each firm analyzed has established at least one suburban branch store, and each management group has exhibited the universal practice of formulating the firm's business objective in terms of the social and economic environment in which it has operated. The marketing strategy of each firm has been unique and has been devised to secure a differential advantage in the market place.

For a number of years department stores, as a group, have been losing their competitive position. The department stores in the central business district of St. Louis have been no exception, experiencing a decline in sales of 15.3 per cent during the period of 1948 through 1954, when

expressed as a per cent of total St. Louis City sales. This adverse trend has continued since 1954.

Although the department store has a number of methods available to increase volume, the branch store has been the one most favored. The branch decision was based on many factors carefully weighed by management. The basic motivating factors were both offensive and defensive. The branch store is a belated recognition by department store executives of a market transition occurring in the metropolitan area, minimizing former advantages of location and traditional operating methods.

The more specific reasons given by store executives were: (1) to tap the growth potential of population and purchasing; (2) to reach areas of potential customers who were previously not purchasing a competitive share of merchandise in the downtown store; (3) to expand the store's total operation; (4) to service customers in an area not presently cared for; (5) to supplement facilities of the parent store.

Preliminary decisions concerning the establishment of each branch store were made by its key executives and then approved by its board of directors. Independent research organizations contributed data for decision making in the form of primary research data. Considerable reliance was placed on the recommendations of staff officers, but final decisions were approved or rejected by each board of directors. Decision making, as a process, seems to have progressed through two recognized stages--decisions made through insight from impression of market ferment, and their effectuation involving risk; and then decisions made from a mass of market data, recorded and personal store experience, with a reduction of risk taking in subsequent operations.

The extent and future of branch store development in St. Louis cannot be accurately determined, but the trend in new stores seems to be toward larger units. One definite conclusion can be made--the success of the branch will determine the geographical limits of that type of expansion for the department store. If the units are successful there will likely be a decrease in the importance of parent stores as retail outlets.

Microfilm \$2.85; Xerox \$9.90. 218 pages.

THE ECONOMIC, ACCOUNTING, AND
FINANCING PROBLEMS IN THE EXPANSION
OF THE NATURAL GAS INDUSTRY WITH
SPECIAL REFERENCE TO TRANSMISSION.

(L. C. Card No. Mic 60-280)

Paul Gamble LaGrone, Ph.D.
University of Alabama, 1958

The natural gas industry is the sixth industry in size in the United States; it is possibly the fastest growing industry in the United States today. To take advantage of a waiting market, the industry has conceived a gigantic construction schedule covering the next four years. With debt issues affording an almost certain return to conservative investors and common stock being in great demand, money for the expansion seems assured. Construction is presently at an all time high with the schedule over the next four years calling for expenditures totaling \$7.3 billion.

Natural gas officials anticipate that 36 per cent of the funds for planned expansion will come from within the industry, the remainder being financed with 48 per cent debt issues and 16 per cent equity securities. Serious investor resistance is not anticipated because of two strong appeals: (1) booming nature of the industry offering a quick return to the investor with imagination; and (2) a sound future for the industry to reassure the investor interested in steady earnings over a long period.

In spite of its rising price, gas is actively meeting competitive fuels today and it should maintain a strong competitive position in the foreseeable future. It is expected that the diminishing price differential will damage the competitive position of natural gas only in special areas. Rigid price controls established by the Federal Power Commission will probably continue in spite of vociferous dissent from industry spokesmen.

One clear trend emerges from current market conditions: the natural gas industry is giving ever increasing attention to domestic customers. A large majority of the industry's 30 million customers are domestic consumers, although industry has been consuming 70 per cent of the total marketed gas. Because storage facilities will permit natural gas to be held for domestic users who need it for heating during the winter, "interruptible" sales seem destined to decline.

Natural gas officials have recognized the importance of research, as evidenced by the fact that large sums of money are spent through a research committee maintained by the American Gas Association. Through research the industry is destined to benefit from such innovations as aluminum and plastic pipe. Research has caused gas to become important in the chemical and petrochemical industries.

As the general public sees it, there are two natural gas "industries." One, privately owned, consists of a vast administrative organization and land containing towers, pump houses, compressor stations, and thousands of miles of buried pipe necessary to carry the gas into the houses and factories of the nation. The other, two government organizations, consists of the Federal Power Commission and the Securities and Exchange Commission. These commissions seem destined to control every phase of the industry.

Pro forma financial statements must be sent to the Federal Power Commission to substantiate proposed expansion of facilities of the gas industry. Collection of data for expansion of facilities may not appear to be accounting; however, the problems of the engineer in estimating cost for such an expansion are to a large extent cost accounting problems. Accounting is vitally important throughout the life of an expansion project, from the early studies until the project is determined to be economically feasible, and from the time a Certificate of Convenience is granted until it is recorded in the plant account records.

There is a promising future for the natural gas industry in the United States. In the past years the industry has thrived under regulation, and it should continue to do so in the future if present standards of regulation are maintained, if its competitive advantage is retained, and if exploration for future reserves proves to be successful.

Microfilm \$4.10; Xerox \$14.40. 320 pages.

MANAGEMENT BY OBJECTIVES: A PHILOSOPHY.

(L. C. Card No. Mic 60-770)

Eugene Ross Magruder, Ph.D.
The Ohio State University, 1959

One of the purposes of this study was to seek out the commonality of management thinking, attempting to clarify the semantics when possible. Further, the study was an attempt to relate activities to objectives and to ascertain whether objectives are the basis on which managerial decisions are made.

A detailed discussion is presented in which man's basic wants, desires, and aspirations are related to organizational objectives. These relationships are shown to be the motivating factors in organizations.

The study builds a framework of management around which all other aspects can be fitted. The distinction between the objective of management and the content of management is analyzed.

The study develops an activity cycle within which a step-by-step approach is formulated. This activity cycle starts with objectives; defines limitations, both physical and non-physical; points out the nature of guidance; builds a scheme of activities; and explains the performance of activities as they are related to objectives.

The study analyzes the various approaches to management as they are related to objectives. Also, the functions of management are discussed as they pertain to the objectives of the organization.

It was found that there is a commonality of thinking among managers and students of management. This commonality finds its roots in objectives. The study further reveals that activities are related to objectives. The characteristics of quality, quantity, and time are the guides to be used by the manager in his decisions.

The study concludes with the recommendation that managers and academicians further seek this common understanding as a basis for keeping the science of management abreast of our dynamic society.

A philosophy of management, i.e., management by objectives, is developed. The philosophy encompasses the objective of management, which is stated as the maximization of human wants, desires, and aspirations by formulating objectives; defining limitations; providing guidance; developing a scheme of activities; and supervising the performance of activities.

The philosophy then relates the principles, functions, procedures, systems, and techniques of management to the attainment of objectives. The tools of management are given proper perspective.

The study recognizes that activities are performed by people and that "getting things done through people" is an important part of the management process.

The study discusses a philosophy of management in detail without specifically referring to the profit motive.

Microfilm \$2.90; Xerox \$10.15. 222 pages.

THE THEORY OF THE FIRM AND COMPETITION IN THE AMERICAN RUBBER INDUSTRY

(L. C. Card No. Mic 60-768)

James Marion McLain, Ph.D.
The Ohio State University, 1959

Statement of the problem. It was the purpose of this study (1) to indicate the inadequacies of existing theoretical models for explanations of the competitive process under present conditions; (2) to synthesize recent theoretical and empirical findings into an eclectic theory that offers an explanation both of the underlying forces at work and the actual practices that businessmen employ in setting prices; (3) to test the validity of this theory by exploring its adequacy for explaining or predicting what has occurred in the American Rubber Industry; and (4) to suggest some implications of the eclectic theory for public policy considerations.

Methodology. The materials came primarily from library research in published sources. Some information was elicited from executives of the major rubber firms by personal interview. These materials were then analyzed by both hypothetical-experimental and descriptive-historical methods. Because of the non-quantitative nature of the relevant variables, there was no mathematical processing of the data, nor was use made of tabular or graphic presentation.

Summary of the findings. Existing theoretical models have been insufficient to explain the competitive process under dynamic conditions in a predominantly oligopolistic economy. The static theory of the firm is based on unascertainable cost and revenue functions. It cannot take into account futurity considerations or extra-economic motivations. The theory then has limited applicability for policy.

Accordingly, the foundations for a theory of effective competition, that takes into account dynamic factors, has been sketched. The theory is eclectic and admits indeterminacy, but it is based on hypotheses empirically derived. Competition is visualized in three phases. Traditional competitive theory is adequate to explain the beginnings. Subsequently, however, the market position of the firm becomes more important than maximum profits. Similar costs from standardized production processes and products are "marked-up" to arrive at a stabilized price at what is thought to be the full-cost level of efficient enterprises. Lateral transfer possibilities force like price for like quality. Hence a "balance" comes about with each firm trying to protect a market-share derived from historical origins. Now kink theory becomes relevant.

The normal cost price is changed only as it becomes necessary to protect profit margins - not to affect market shares. Firms still compete by non-price devices that cause no shifts in market shares yet nevertheless erode price and profits.

The environment within which this balance is achieved is, however, a constantly changing one. In the third phase competition is between industries. The substitution of unlike goods in the satisfaction of the same general want becomes the essence of competition, forcing efficiency and innovation.

The eclectic theory tended to be more adequate for analyzing the rubber industry than did marginal analysis.

Executive statements were not inconsistent with the basic hypotheses of the eclectic theory.

It is entirely conceivable that there may be elimination of unnecessary price fluidity (responses to short run changes that tend to cancel out) without interfering with the basic competitive structure of industry. Competition should be evaluated in terms of results - not a set of conditions. Microfilm \$4.35; Xerox \$15.30. 339 pages.

OPERATIONS RESEARCH AND ITS POSSIBLE INFLUENCE ON ACCOUNTANCY

(L. C. Card No. Mic 60-281)

Charles Franklin Nagy, Ph.D.
University of Alabama, 1959

This study attempts to determine the extent to which accountancy may be influenced by Operations Research methodology. Following a brief history of Operations Research, the theories of linear programming, queueing, games, and communications are presented. Then, the application of these theories to inventory control, production scheduling, budgeting, and financial planning is examined.

Operations Research applies mathematical techniques to relate the numerous interdependent aspects of inventory control to the over-all financial and industrial pattern of the firm. Cost associated with inventory are classified as either fixed costs or variable costs, and the variable costs, which are considered of primary importance, are expressed in a mathematical model. The economic quantity and the reorder point can then be determined by monograph or electronic data-processing equipment. The technique requires a clear, simple statement of the problem which emphasizes the basic factors important to its solution. These basic factors are studied to determine an economic minimum cost of inventory maintenance.

Linear programming is frequently used in determining the optimum total cost of production. A system of mathematical equations expressing total cost of production, cost of stocking inventory, the cost of back orders, and the restrictions of capacities of equipment is constructed to serve as a model. Linear programming is used to manipulate the model to determine optimum total cost.

The concept of probability budgeting enables management to calculate risk so that decisions to maximize expected profits can be presented in budget form. The probability budget considers opportunity costs and the cost incurred if sales are not of the previously anticipated magnitude. These concepts make it possible to determine the levels of programs or activities which minimize expected costs, including the cost due to the inherent uncertainty of the future. Electronic data-processing equipment has made the implementation of the probability budget practical.

Operations Research groups examine cause and effect relationships when investigating the area of financial planning. The basic thesis is that management can control the effect by manipulating the cause. Control and predictability are considered synonymous in financial planning, so that if a situation is controlled, it has a predictable outcome. An analysis of cause and effect relationships within the firm improves predictability.

If the aroused interest of business executives is a criterion for measuring the future of Operations Research, it will become more widely used. Operations Research integrates information and data in an organized, comprehensive, and systematic analysis and even though the mathematical techniques which are commonly used, are never applied, the objectivity, broad approach, clarification and elimination of conflicting goals can benefit management and improve operational results.

Although Operations Research and accounting differ in method, both strive for a common goal: the optimization of business activity. Cost data, an essential component of mathematical models must be reliable if satisfactory solutions are to be obtained. Accountants should be able to modify, refine, and adjust cost data to reflect the recommendations of research groups and should strive to justify and measure the effectiveness of the suggestions and proposals of such research teams.

To be generally understood, the analytical concepts introduced by scientific team studies require a basic knowledge of mathematics, scientific method and related business areas. In addition to being a specialist, the accountant should have the training and ability to understand and evaluate results obtained by newly developed methods. The educational and training programs for accountants should give serious consideration to the changing role of accountants in an expanding economy and be geared to optimize the staff function of accountants.

Microfilm \$2.50; Xerox \$8.60. 186 pages.

A STUDY OF CORPORATE DECISIONS

(L. C. Card No. Mic 60-21)

Walter Gregory O'Donnell, Ph.D.
Columbia University, 1959

This dissertation deals with the institutional matrix, value structures, and social dynamics of decision-making in corporations.

The empirical core of the inquiry is derived from analyses of fifty major corporate planning and policy decisions, as reported by top-level executives actually involved. Sample survey method, questionnaires, and interviewing were used to gather the empirical data.

As a formal economic institution, the industrial corporation is seen as a purposive sub-society, as well as a productive economic unit of collective action, operating in a multi-dimensional environment.

The institutional matrix of the corporation constitutes an important source of influence in giving shape and direction to corporate decisions. Economic action in the corporation is regarded as operating through a social organization structured with relation to corporate purposes.

The purposes of industrial corporations are found to be multi-valent. Although relatively stable, corporate value systems are various among companies, and variable within a company. Related value components, interdependent and co-variable, including ethical, cultural, social, institutional, human, and economic values, are found to be arranged in a configuration of values that are weighted in some scale or order or priority. No analyzed decision

was attributed to a single criterion of value, such as profit maximization.

The corporate value structure, as a limiting selector-system, serves as a frame of reference from which the premises of decision are drawn. The ends-in-view in a corporate value system provide the basis for directed coordination of unified action in the corporation. The value system also functions as an object of group motivation, morale, and cooperation, as a logical basis for rational consistency in a series of decisions, and as a point of reference for the resolution of conflicts within the organization.

The social dynamics of decision-making in corporations is found in patterns of group thought and action, the interactions of people engaged in decision-making, the system of communications and flow of information, linkage of decisions in series, and the reactions to decisions in the organization. Corporate decisions are found to be organization-centered rather than individual-centered, unlike the personal and private decisions of investors and consumers. Nearly all specimens of decisions analyzed are characterized by the decision-makers as either a composite decision made jointly with others, or as an individual decision resulting from the interaction of several minds in consultation.

This study has increased confidence in the three following hypotheses:

In the management of organized economic institutions, such as the industrial corporation, major economic decisions on corporate plans and policies are motivated and shaped by the structure of values, including not only instrumental calculations of profit and expectations of personal gain, but social and institutional values that are objectives of the collaboration of the whole organization.

The process of corporate decision-making is typically a cooperative social process, involving both means and ends, in which interactive ideas, interests, and aspirations of individual members and sub-groups are integrated on the more inclusive level of commonly accepted corporate objectives, in order to achieve effective collective action in the realization of common purposes.

Every industrial organization has an institutional value system (systematic or intuitive; explicit or implicit) which, as a frame of reference, structures, limits, and guides the making of corporate decisions, facilitating the resolving of conflicting views, interests, and aspirations within the organization, and providing the logical premises for rational consistency and purposeful cooperation in the industrial organization.

It is maintained that these warrantable assertions establish a beachhead for further inquiry and empirical research in this strategic phase of industrial administration.

Microfilm \$8.25; Xerox \$29.50. 652 pages.

REVOLUTION IN THE AIR LINE PILOTS ASSOCIATION

(L. C. Card No. Mic 59-6903)

Karl Maxwell Ruppenthal, Ph.D.
Stanford University, 1959

This is a study of a revolution which took place in an important labor union. When the revolution began,

David L. Behncke was president of the Air Line Pilots Association, which he had helped to found. When it was over, the union had been reorganized, its Constitution rewritten, and Behncke recalled from office. The study describes the pressures which built up within the union and Behncke's reaction to them. It indicates why the revolution occurred, how it might have been avoided, and other actions the revolutionaries might have taken.

The dissertation is based on federal court records, transcripts of the meetings of the ALPA's Executive Board and Board of Directors, NLRB records, Presidential Emergency Board reports, voluminous correspondence, news bulletins, and memoranda in the files of the Air Line Pilots Association. Since the writer was a participant in the revolution, he had available many sources of information not readily accessible to researchers. Included in the exhibits are letters from Behncke attempting counter-revolutionary measures and the report of the investigating committee. Pertinent paragraphs from the court proceedings are quoted.

The study is interesting from a legal standpoint. When Behncke resisted recall from office, the revolutionaries sought an injunction in federal court. The litigation continued for months. Important legal ground was plowed, and several democratic rights of union members were asserted.

While the legal aspects of the revolution are important, probably the social implications are greater. The study shows how the governing body demanded that the union's operations be investigated and details how the investigation proceeded. (The entire report of the investigating committee is reproduced in the appendix.) It indicates the constitutional changes which were made to enable the union to be more responsive to the needs of its members.

The study should be of interest to other unions, because it indicates what can happen to an organization when its leader is unable to keep pace with reality. It indicates how a man who contributed heavily to a union in its early days can become a millstone when the organization matures. The members of such an organization may be faced with the distasteful choice of seeing their organization disintegrate or removing a man who once was an effective leader.

White collar unions should find the study of particular significance. Air line pilots are generally well educated and relatively well paid. They think of themselves as professional people, and they have much in common with engineers, doctors, and other white collar workers. They are concerned with licensing requirements and professional standards. The study indicates some of the problems which white collar unions may face and how this union attacked those problems.

Microfilm \$2.90; Xerox \$10.15. 221 pages.

PRIVATE FOREIGN INVESTMENT AS A POSSIBLE AID FOR THE ECONOMIC GROWTH OF IRAQ

(L. C. Card No. Mic 60-398)

Fuad H. Tellew, Ph.D.
University of Southern California, 1959

Chairman: Professor Garis

The primary goals of this study are: (1) to determine how private foreign investments can contribute to the growth of Iraq's economy; (2) to determine whether the contention that there are serious barriers to such investments in underdeveloped countries applies to Iraq; and (3) to devise possible solutions to the problems which may arise in order to ensure the successful development of Iraq's economy through the aid of private foreign investments.

Iraq is an underdeveloped country which possesses great potentialities for economic growth. In its possession of significant untapped resources—land, water, and minerals—and a large source of foreign exchange from oil, the country has a unique combination of attributes which provide Iraq with exceptional opportunities for achieving rapid economic growth.

However, despite the excellent potentialities for rapid economic development, Iraq, like most underdeveloped countries, is today suffering from a serious shortage of men with entrepreneurial, managerial, and technical ability—people with skill, know-how, and experience who can seek and discover investment opportunities to turn the available resources into productive projects. The scarcity of such human talents is a major bottleneck inhibiting the industrial and agricultural development and all hopes for rapid economic growth of Iraq. The need in Iraq for people possessing these kinds of talents, therefore, is urgent.

Direct private foreign investments in conjunction with local investors offer the best approach for providing the needed human resources in Iraq for the following reasons: (a) this approach is more compatible with the private enterprise system of economics and, therefore, it will enable the economy to grow rapidly via sound democratic principles; (b) it will provide much of the needed personnel directly from abroad; (c) more important, it will help to promote the spread of modern technology and efficient managerial techniques. Not only will this approach directly supply foreign entrepreneurs, managers, and technical experts, but also it will generate a supply of indigenous talent for the future; and (d) last but not least, the joint enterprise approach will help to bring about economic expansion, not only by directly initiating productive enterprises but also indirectly by stimulating the development of corollary enterprises, all of which are expected to speed up economic development and raise the standard of living of the Iraqi people.

Iraq is capable of benefiting from the joint enterprise approach because the country can provide an investment climate which is reasonably attractive. The country possesses numerous profitable investment opportunities. All the risks and obstacles—such as nationalization and confiscation, exchange controls and restrictions against capital and profit transfers, the lack of public facilities and utilities, and the absence of profitable markets,

so often mentioned as being the major factors inhibiting the flow and operation of direct private investment in underdeveloped countries—either do not exist in Iraq or can be reduced to a minimum.

But the joint foreign-local private enterprise approach is expected via the additional investment expenditures it incurs to bring about inflation. This is regarded as a major disadvantage of the joint enterprise approach. Hence Iraq should devise a policy which will combat inflation and, at the same time, obtain the advantages of this approach. Iraq, therefore, should refrain from combating inflation and its effects by means of price controls, exchange controls, or devaluation, for such methods would tend to discourage foreign investments in Iraq. Rather, the country should eliminate most of the import barriers and maintain a liberal import policy. Such a policy will make possible the import of the desired goods to meet the increased demand. Consequently the effects of inflation can be reduced.

A liberal import policy will not entail serious hardships in the balance of payments because Iraq possesses now and expects to continue to obtain a sufficient amount of foreign exchange in the future.

In conclusion, if Iraq adopts the joint foreign-local enterprise approach the country will have a bright opportunity for achieving a rapid economic growth.

Microfilm \$4.55; Xerox \$16.00. 354 pages.

ECONOMICS, FINANCE

THE PRICE OF UNDERWRITING SERVICES ON CORPORATE DEBT, 1935-1952.

(L. C. Card No. Mic 60-1)

Avery Berlow Cohan, Ph.D.
Columbia University, 1959

Underwriting spreads on new corporate debt offerings declined substantially between 1935 and 1952, on the average, slightly more than 50 percent. This decline was the by-product of great changes during the period in the character of the market for long-term corporate debt.

In the pre-S.E.C. period, the investment bankers were in substantially full control of the market. Private placement, and competitive bidding (except on railway equipment trust certificates) were virtually non-existent and issuers in need of long-term debt financing had no real alternative but to sell bonds to the bankers--by and large through the medium of a negotiated transaction. The bankers re-sold such bonds directly (and indirectly through non-underwriting dealers) to a widely scattered multitude of individual investors.

But beginning in the early thirties issuers of all sorts began to find a variety of new alternatives available to them. Industrial (IFS) issuers were able to choose between the negotiated transaction on the one hand and private placement on the other and, in some circumstances, between these two alternatives and bank term loans. During a large part of the period, and especially in the more recent years, most Public Utility (PU) issuers were able

to choose, more or less freely, among three alternatives: a negotiated transaction, a PSB or a private placement. Rail issuers, it is true, had fewer alternatives available to them than did IFS and PU issuers--largely because the financial institutions, especially in the earlier part of the period, were not much interested in rail securities. But competitive bidding was a real alternative before 1944 (and numerous rail issuers availed themselves of it) and it was compulsory after 1944. In short, by 1950 less than 40 percent of all corporate debt offerings were underwritten, less than 6 percent were negotiated, wide distribution to individual investors had decreased substantially in importance, and the bankers were competing actively in terms of price--with each other and with other sources of funds.

A variety of influences participated in producing the foregoing result: the passage of the Securities Act of 1933, the compulsory competitive bidding rules, the decline in interest rates. But the most important influence by far was the decision by individual investors to hold a larger proportion of their funds in assets the dollar value of which was "guaranteed." This decision led directly to the remarkable growth of the assets of financial intermediaries which, in turn, meant the creation of a large source of funds alternative to the public offering. It meant, conversely, that issuers were freed, to a substantial extent, of dependence on what had been the bankers' prime resource--to wit, their highly efficient selling organizations, their selling "know-how" and, in general, their highly developed ability to place securities with large numbers of widely scattered individual investors.

Microfilm \$4.45; Xerox \$15.55. 345 pages.

FOREIGN CENTRAL BANKING, 1946-1957: THE INSTRUMENTS AND EFFECTIVENESS OF MONETARY POLICY.

(L. C. Card No. Mic 60-7)

Peter G. Fousek, Ph.D.
Columbia University, 1959

By 1957 almost every country in the free world had turned to monetary control to help safeguard and promote its economic health. Most central banks abroad, however, have had to operate in a setting greatly unlike that of the United States, since most foreign economies and financial systems are either less developed than ours or have developed along other patterns. The techniques of foreign central banks have thus often differed substantially from those of the Federal Reserve System. This study first describes the use of central banking techniques abroad during the postwar period, including the development of money markets through which so much of the implementation of monetary policy must be affected. It then attempts to evaluate the effectiveness both of the various credit control tools and of over-all monetary policies outside of the United States.

Discount policy abroad has generally been more complex in structure and has often carried more weight in over-all monetary policy than it has in this country. While it has rarely been used to influence the availability of bank credit directly, discount rate changes have had a

powerful impact on interest rates and the discount instrument has shown itself to be an important supplement to other measures. Open market operations have only rarely been the primary credit control tool abroad that they have become in the United States. The most serious obstacle to their use abroad has been the lack of broad money and capital markets, even among the more financially developed countries. A meaningful open market policy has also frequently been frustrated by inflationary fiscal policies. Nevertheless, the foreign experience has shown that open market policy can be a most effective monetary control instrument. While the enforcement of alterations in commercial bank cash reserve requirements is generally considered a much blunter instrument, such requirements have been established in a great many countries in recent years, and changes in minimum ratios have come to be used increasingly as a major credit control tool. Some central banks have even relied on them as a substitute for open market operations. A number of foreign countries have also established securities reserve requirements or a variant thereof, often called minimum liquidity ratios. As a rule however--except for the original inflationary periods when they were first established--these special requirements were more harmful than beneficial. Foreign central banks have also relied on a great variety of direct and selective credit controls. Selective credit controls abroad have aimed not only at curbing credit extensions in directions deemed undesirable but also at stimulating lending to sectors regarded as essential. In recent years, however, there has been a definite trend away from direct and selective controls. These controls used alone have generally proved a failure, although they have had their place as supplements to general quantitative instruments.

Evaluating the effects of monetary policies is not an easy task. Disentangling the influence of credit controls from that of other policies and from other forces is often not possible. The evaluation is likewise made difficult by the absence of any simple criterion of success. Nevertheless, the evidence appears to be strong enough to permit the writer to put forward the judgment that monetary policy has been able to make an important contribution to balanced economic growth in many foreign countries. In many other countries, on the other hand, credit controls have accomplished little. This latter situation, however, appears to have been the result of the halfhearted and belated manner in which the controls were carried out and of the lack of support they had from budgetary, debt management and other economic policies.

Microfilm \$3.65; Xerox \$12.85. 284 pages.

EROSION OF THE PERSONAL INCOME TAX BASE IN CANADA AND THE UNITED STATES

(L. C. Card No. Mic 60-264)

Irving Jay Goffman, Ph.D.
Duke University, 1959

Supervisor: B. U. Ratchford

This dissertation is concerned with the large amount of income which legally escapes the full impact of personal

income taxes in Canada and the United States. This erosion of the tax base is the result of changes in the statutes and of changes in taxpayer practices to take advantage of existing provisions of the laws. In some cases, preferential treatment of certain types of income and certain groups of taxpayers has existed since the first income taxes were levied in the two countries. In recent years, however, particularly under the impact of high tax rates since World War II, the process of erosion has been considerably accelerated and broadened in scope. It is the purpose of this study to examine the income tax structures in Canada and the United States in order to determine the extent to which present preferential provisions and practices contribute to the erosion of the respective tax bases and to suggest the economic consequences of this process.

Income is considered to be an economic rather than an accounting or legal concept, and the definition used as the criterion for determining the theoretical (or uneroded) tax base is the one most fully developed by Professor Henry Simons. To the extent that the actual statutory tax base differs from this theoretical model, erosion is said to be present. In other words, if a gain is considered income in an economic sense, it ought to be so considered for tax purposes without any special privileges. Otherwise, it is the subject of erosion.

The areas examined which were found to be subject to this withering away of the tax base in one or both countries are: (1) income excluded from the statutory definition of income, such as income in kind, part of the income of government employees, certain social security benefits, the interest on certain government obligations, and part of cash dividends; (2) gains which result from a realized increase in the value of capital assets and consequently are preferentially treated; (3) income which is included in the statutory definition but is exempted from taxation, such as personal and dependent exemptions and personal non-business deductions which include among other things certain interest and tax payments, medical expenses and charitable contributions; (4) expenses which are deductible because they are erroneously regarded as contributing to the production of income, such as certain employee expenses, part of fringe benefits and expense accounts, accelerated depreciation allowances and percentage depletion allowances.

The result of the preferential treatment of these items is to reduce the actual tax base in both countries to about one-half the size of the theoretical, uneroded base and thus to require higher rate structures than would otherwise exist. At the same time, this process of erosion introduces considerable inequity into the income tax system, reduces the efficiency of the tax as an automatic stabilizer, and interferes with the efficient operation of the allocation function of the product and factor markets by destroying the neutrality of this form of taxation.

Microfilm \$3.85; Xerox \$13.50. 298 pages.

**CERTAIN ASPECTS OF
CORPORATION MANAGEMENT
AND FINANCE IN INDIA**

(L. C. Card No. Mic 59-2792)

Raghuvir Gupta, Ph.D.
University of Maryland, 1958

Supervisor: Professor Allan J. Fisher

This dissertation is based on an intimate and personal study of India's economic, industrial, social, legal and administrative patterns and institutions of which the author has been a part or with which he has dealt during a large part of his life.

As an introduction, a general picture of the Indian economy is drawn. India's per capita income, barely \$60, is one of the lowest in the world. There seems to be no definite tendency toward the improvement of this income. The economy of India is rather static, mostly because of primitive agricultural practices and rigid socio-cultural patterns; industry is in its infancy.

The statistics of joint-stock companies show that, although the number of new registrations of companies is slightly higher than the number of failures, the paid-up capital that comes in through new registrations is less than the capital that is lost through business failures. However, this loss in capital is more than offset by the expansion of the surviving companies. The trend is toward concentration of capital.

A major part of the dissertation deals with the organizational and managerial structure of Indian companies. Superficially, the basis of company management through directorships in India is the same as in the United States of America; the working is entirely different. In the Indian corporate system, the managing agency institution is a unique and outstanding feature. Managing agents are appointed by means of a contract with the company for a specified long period of time. Normally it is the directors who control the management of a company; instead, in India usually it is the managing agents who control and appoint the directors. In such cases, the directors are merely puppets in the hands of the management. In addition to permitting managing agency contracts, the Indian Companies Act tends to favor the management by providing for the staggered election of directors and the system of voting by show of hands in the first instance. The stockholders are usually excluded in fact from the affairs of their companies. Mismanagement of companies and misappropriation of corporate funds are not uncommon in India.

Another section deals with the sources of capital for companies in India. As is common in the corporate systems of most countries, the Indian companies sell ordinary shares, preference shares and debentures or bonds. But the market response to company securities is extremely poor in India. Only a few well-established managing agency houses may hope to raise share capital. The raising of private capital has been further hampered by the nationalization of the life insurance business in India in 1956.

No private underwriting agencies similar to American investment banks exist in India. An attempt is being made to fill that gap by the establishment of a few public or semi-public agencies or through international financial

institutions which sometimes provide loans to Indian industry, and in some cases even underwrite its securities.

The general conclusion is reached that, more than the scarcity of capital, outmoded laws and a static social structure are at the root of India's economic problems.

Microfilm \$4.20; Xerox \$14.65. 325 pages.

**DIFFERENTIALS IN INTEREST RATES
AND THE COST OF
COMMERCIAL BANK LENDING**

(L. C. Card No. Mic 60-38)

Albert Murray Levenson, Ph.D.
Columbia University, 1959

At least since the work done by Winfield W. Riefler in 1930 it has been widely accepted that interest rates on commercial bank loans vary inversely with size of borrower. In sampling surveys of member banks of the Federal Reserve System the Board of Governors, in 1942, 1946, 1955 and 1957, produced a body of information which supported this conclusion. These surveys also show that a major part of the variation of rates by Districts and by industries are due to differences in size of borrower and size of loan (two highly correlated variables.)

The fact of the inverse correlation between size of borrower and interest rates on commercial bank loans has been widely interpreted as evidence of rate discrimination in the commercial loan market and at least part of the rationale for Federal loan programs to small business has been this view of the market.

This study presents the major evidence which has been gathered on the subject of differentials in commercial loan rates. An attempt is made to assess the proposition that the observed inverse correlation of the interest rates with size of borrower is a reflection of a substantial difference in the cost of making loans by size of borrower. This cost difference, it is believed, may explain a substantial part of rate differences between borrowers of different sizes and in so doing also explain other rate differences, such as geographical ones, which are tied up with different borrower size characteristics.

This investigation for the first time, it is believed, attempts a direct determination of the difference in cost to banks in lending to "small" as opposed to "large" borrowers. The data analyzed was for 143 member banks of the Federal Reserve System which participated in the 1955 Business Loan Survey in one of the Federal Reserve Districts. In the final statistical analysis it was possible for the 35 largest banks in the sample (those with over \$50 million in deposits) to estimate expense rates on "small" business loans (those to firms with less than \$250,000 in assets) and "large" business loans (those to firms with more than \$250,000 in assets); the former was 6.1% and the latter 2.3%. The average expense rate as estimated here for "small" business loans is more than twice that for the other class of business borrowers. The experience of the Small Business Administration with its business loan program lends support to an expense rate this high on "small" business loans. These estimates are, however, subject to rather high standard errors of estimate.

The finding of this study is that for the banks studied the differentials in interest rates between "large" and "small" borrowers have been justified by the estimated cost differences in making loans to these two groups of borrowers (in 1955). This conclusion is, however, only very tentative because of the wide variation to be expected around the expense rates estimated from the small number of banks for which data was available. It is hoped that further analysis will be possible to substantiate these results and check their validity for commercial banks as a whole when a wider and more detailed range of data becomes available.

Microfilm \$2.50; Xerox \$5.20. 103 pages.

THE SIGNIFICANCE OF RESTRICTED STOCK OPTIONS IN COMPENSATING THE EXECUTIVES OF 160 SELECTED CORPORATIONS

(L. C. Card No. Mic 59-5572)

Charles Francis Poston, Ph.D.
The University of North Carolina, 1959

Supervisor: Joe S. Floyd, Jr.

It is of the utmost importance for the corporation to be able to cultivate, nurture, and retain skillful management, for only by providing itself with capable executives can the corporation expect to fulfill its function as the most important form of business organization in modern society. To provide itself with capable management, the corporation has evolved through time various types of incentive compensation. As a part of this evolution the restricted stock option, since its inception in 1950, has become one of the most effective devices for providing incentive for management and only less effective in encouraging executives to acquire a proprietary interest in their company.

The executive has found the restricted stock option a particularly effective device for providing him with additional compensation. Most of the incentive compensation arises out of increases in the market price of the company's stock and without encountering the risks normally associated with stock ownership. In addition to offering the executive the opportunity for a riskless investment, the restricted stock option also applies the capital gains tax rates to any appreciation in the value of the stock which accrues to the executive.

The stockholders have also found the restricted stock option one of the more effective forms of incentive compensation. It permits the corporation to purchase executive talent with less expenditure of company funds than the more direct forms of incentive compensation. Furthermore, this is achieved without undue dilution of either the shareholder's control or his equity in surplus.

In examining the restricted stock option from the point of view of society, it is possible to raise serious objections to the working of the option plans as well as to challenge the social and ethical implications arising out of the preferential tax treatment which the restricted stock option bestows on management. The application of the capital gains tax to the appreciation which the executive receives on a riskless investment does not seem justified. Nor does it seem ethical to permit the executive

to use what would normally be tax dollars to purchase a proprietary interest in his own company.

The rapid increase in the use of the restricted stock option as an incentive device necessitates a careful examination of the operation of existing option plans in order to suggest modifications in the present option law to make the results more compatible with social philosophy.

Microfilm \$3.15; Xerox \$11.05. 242 pages.

A SURVEY AND EVALUATION OF ALTERNATIVES IN A STRENGTHENED LOCAL GOVERNMENT REVENUE STRUCTURE WITH SPECIAL REFERENCE TO PENNSYLVANIA

(L. C. Card No. Mic 60-518)

G. Alden Sears, Ph.D.
New York University, 1957

Adviser: Dr. Richard A. Girard

A dangerous imbalance exists today between local tax capacity and local expenditure requirements. Four main possibilities for dealing with the problem are: structural improvement of local government; centralization of functions at the state level; more state aid; and new local sources of revenue. Structural reorganization is essential but time-consuming and local government needs immediate strengthening. This study assumes that avoidance of centralization is a desirable social goal and that a wide area of local competence exists for the provision of public services. It argues that the last two options are the most desirable. Of these, state aid carries the dangers of central control or extravagance in local expenditures. General purpose per capita grants, however, preserve certain advantages of decentralization and have important fiscal advantages obtainable by adjusting grants to local needs and developing stabilization reserves.

The heart of the thesis is an evaluation of the real estate tax and various non-property taxes in terms of equity, neutrality, administrability, significance of yield, and stability or flexibility of yield. Special emphasis is placed upon non-realty taxes employed by Pennsylvania local governments. These are the earnings tax, per capita or poll tax, amusement tax, gross receipts tax, deed transfer tax, intangible personal property tax, personal occupation tax, and other sales taxes and service charges.

The intangible personal property tax of the counties and occupation tax typically are unproductive, inequitable, and difficult to administer. Local units should discard them. Analysis of the realty tax confirms its regressivity, particularly in the lower income ranges, but (1) introduces significant qualifications of this criticism of the tax, and (2) in contrast to prevailing opinion, discloses considerable potential for growth under normal expansionary conditions and greater stability in a contraction than in the past because of the increased stability of the economy, better administration, and reduced burdensomeness.

Stress is placed on the need for and feasibility of greater local reliance on non-realty tax revenues. Of these the earnings tax is most promising. It has several

recommendations as a major supplement to the real estate tax: (1) a high yield at low rates, (2) proportionality or slight progressivity in the lower income ranges, and (3) flexibility of yield. It has an elasticity coefficient of about 1.00 as compared with about 0.50 for the real estate tax under growth conditions. The greater stability of realty tax collections in event of recession, together with sounder local credit, the Federal commitment to promote full employment, and the increased importance in local budgets of state aid appear to warrant greater local reliance on the earnings tax.

Per capita or poll taxes in Pennsylvania provide more local revenue than any non-property tax except the earnings tax. They are regressive and difficult to administer, but levied at fairly high rates of \$10 or \$15 and with certain safeguards can produce good yields for small rural communities with the least serious equity effects.

Gross receipts taxes at moderate rates, deed transfer, and amusement taxes are all more equitable and easier to administer than the real estate tax, and provide significant yields for many jurisdictions. Service charges are more equitable than real estate taxes, more easily administered, and can produce large revenues.

Administration of the real estate tax should be improved, but that tax is not the only, or even the best, source of increased local revenues. More intensive utilization of non-property revenue sources is immediately practicable for local governments, can improve the equity of local revenue structures, and improve the response of local revenue in periods of economic growth of inflation without undue danger to financial strength during periods of contraction. They can buttress local revenue systems and can be placed in operation more quickly than major attempts to improve the structure of local government.

Microfilm \$7.40; Xerox \$26.35. 581 pages.

THE COMMON TRUST FUND

(L. C. Card No. Mic 60-799)

Benjamin Sturges Stevenson, Ph.D.
The Ohio State University, 1959

The common trust fund is a vehicle for placing in one fund the moneys of many small personal trusts, for the general purpose of obtaining greater stability of income and principal values through diversification of investment. It enables a corporate trustee to improve the administration and reduce the cost of operation of smaller trusts.

In an attempt to secure additional information in relation to the common trust fund, the writer surveyed fifty banks operating common trust funds. Of the total common trust funds of \$1,965.5 million held at the end of 1957, the responding banks accounted for \$1,163.8 million, or 59 per cent of the total.

The aggregate figures for these common trust funds were analyzed year by year for the eight fiscal years, 1950-1957. A series of index numbers was constructed for the principal valuations with 1950 as the base year. The average annual income returns were based on the total income distributions during each given fiscal year; the annual yield was computed with the principal valuation at the end of each preceding year as the base.

The range of average principal value variation was from 100 to 150.14 for banks in the California area, and from 100 to 121.14 for banks in New York City. The range of average annual yield was from 3.33 per cent to 4.36 per cent.

The results of operation of the common trust funds surveyed from 1950 to 1957 confirm the beliefs of trust officers who maintained that the common trust fund would result in a greater income return and an increase in the principal valuation of units of participation to participants in the common trust fund. A comparison of the results of operation of common trust funds is more logically representative when a comparison is made with the alternative investment which trust officers would choose for small trust accounts if the particular banking institution did not operate a common trust fund. In most cases a trust officer would be justified in placing such funds in United States Government securities and the results of such an investment policy would be less than rewarding to a trust beneficiary both in respect to annual income and preservation of purchasing power.

It has been only within recent years that the common trust fund has gained any recognition as an investment medium for individuals. Although the total assets and common stock holdings of common trust funds are small in comparison with other institutional investors, there is a definite possibility that the growth of common trust funds will be excellent when and if more banks commence operations of such funds. The number of small trusts and the number of small banks managing trust assets are indicative of the potential growth in this area.

The use of the common trust fund can reduce the costs of administration and increase the diversification of investments and provide a larger income return than was formerly possible in the investment of small trust funds. As more information is made available on the common trust fund to trust officers, attorneys, and investment counselors, more efficient administration will result and greater benefits may accrue to small trust beneficiaries.

Microfilm \$3.00; Xerox \$10.35. 230 pages.

DESIGN OF AN ASSESSORS' MANUAL FOR A PARTICULAR STATE

(L. C. Card No. Mic 60-713)

Earl Kenneth Turner, Ph.D.
University of Kentucky, 1951

As a key part of a long-range program for improving assessment, the Kentucky Department of Revenue wishes to provide an adequate manual for the state's local assessors. The function of assessment is to determine the value of taxable property. As value has many facets, the manual which shows the road to it will necessarily be of broad design. The purpose of the study is to gain a picture of a desirable manual for the benefit of the designers. It seeks to develop a proper perspective for designers and the points important in construction. The study does not consider the department's actual plans for obtaining a manual, but maintains a detached point of view throughout.

The role of a manual is to transmit and integrate a

program for assessment. The program itself also strongly effects the character of a manual. The study outlines a comprehensive program for effective assessment, with emphasis on Kentucky's new plans.

The study reviews the contents of the different appraisal manuals--commercial, city, county, commercial credit, and state. It arrays the state manuals by patterns, from simple to compound.

The central thesis of this study has been that the break-down of assessment occurs at the local level--from lack of appraisal knowledge, training, and technical assistance. Accordingly, to be an effective guide, a manual must first of all have readability for the assessors and the taxpayers on whom successful administration primarily rests.

Because value is local and changeable, realistic designers will produce a flexible manual. Illinois employs a conversion table for adjusting cost factors to subsequent time and particular areas of the state, by classes of buildings. California and Oregon keep costs current by issuance of factor books. But one instance of variability underlines the need for adaptability of value factors in a Kentucky manual: the cost of structural steel will be perhaps a third higher at Bowling Green than at Paducah, where the Ohio River furnishes relatively cheap transportation.

Comprehensiveness of treatment also means conformity to the economic pattern of a state. A Kentucky manual must provide special treatment for the predominant kinds of property--farms, coal, and timberland--and typical treatment for the common types, such as residences. It must also deal adequately with property somewhat peculiar to the state--for example, race horses. Some counties may likewise have unrepresentative property to assess, such as oil wells and boats.

Moreover, a manual must be comprehensive as to function. It will provide treatment for review boards and ample explanation for the taxpayers.

In exhibiting the contents of appraisal guides, the study shows designers where to find sources of material. Because of the standardization in assessment science, designers can draw heavily on the eclectic approach. In a few instances, origination will be necessary. California offers an indexing system which lends essential handiness to an extensive set of guidebooks. The designers have placed the stable procedural sections in bound volumes and the changeable price schedules in loose-leaf volumes. Properly handled, the loose-leaf arrangement allows attainment of a localized manual. Readability will be promoted, because a particular version of the manual will contain treatment for only the types of property found in the assessor's own county.

Microfilm \$8.85; Xerox \$31.50. 699 pages.

ECONOMICS, HISTORY

RECENT HISTORY OF THE NORTH CAROLINA FURNITURE MANUFACTURING INDUSTRY WITH SPECIAL ATTENTION TO LOCATIONAL FACTORS

(L. C. Card No. Mic 60-404)

Mary Eleanor Craig, Ph.D.
Duke University, 1959

Supervisor: Robert S. Smith

The purpose of this study was to determine how furniture manufacturing began at North Carolina and why it grew in that location.

In 1888 furniture manufacturing plants were first located in North Carolina by natives of the state who saw an opportunity for profit in fabricating the abundant supplies of local timber. Probably the timber supply was the most important advantage producers of the area had during the first twenty years of furniture manufacturing in North Carolina. This advantage has diminished gradually with the depletion of local hardwood stands. Now a little less than half of the North Carolina furniture factories' supply comes from within the state.

At the inception of furniture manufacturing in North Carolina labor was available at low wage rates, relative to those of the national industry, but the advantage of low wage rates tended to be offset by the workers' lack of training and skills. A wage differential between the South and non-South continues to exist for many furniture occupations, but it seems likely that today the North Carolina worker, given the same equipment, is as efficient as workers elsewhere.

Capital was relatively easy to acquire in the amounts needed for the establishment of the early firms. For firms beginning production now, capital may be somewhat more difficult to obtain. Characteristically North Carolina furniture firms have obtained capital for expansion by reinvestment of profits.

Greater mechanization of southern than non-southern plants in the 1930's reportedly contributed to the growth of North Carolina furniture manufacturing then and later. Probably the greater mechanization in North Carolina resulted from more favorable attitudes toward expansion on the part of North Carolina manufacturers than of other furniture manufacturers rather than from differences in access to capital. North Carolina entrepreneurs have a reputation for an experimental approach, which some observers attribute to the relatively recent development of North Carolina furniture manufacturing.

Access to markets, which depended upon low freight rates to northern markets, as well as upon nearness to southern markets, for cheap furniture, was also a significant factor in the early growth of North Carolina furniture manufacturing. Relatively low freight rates for southern producers persisted into the 1920's, the decade during which North Carolina manufacturers upgraded their furniture products and began to sell in the national market. Since the 1920's a factor of increasing significance as an advantage to North Carolina producers has been their growing reputation as a market center. This reputation attracts additional buyers to the area. The growth of ancillary industries has not been great, and the benefits

derived from the growth which has taken place have been insignificant.

The acquired advantages of market reputation, a trained labor force, and experienced management, together with whatever advantage remains in local timber supplies, presage the continuance of North Carolina in the ranks of major furniture producing states.

Microfilm \$3.70; Xerox \$13.05. 286 pages.

IMITATION BY CANAL OR INNOVATION BY RAILROAD: A COMPARATIVE STUDY OF THE RESPONSE TO THE ERIE CANAL IN BOSTON, PHILADELPHIA, AND BALTIMORE.

(L. C. Card No. Mic 60-42)

Julius Rubin, Ph.D.
Columbia University, 1959

The completion of the Erie Canal in 1825 gave to New York City the only possible relatively water-level route through the Appalachians at a time when the development of the west provided the great opportunity for expansion to the merchants of the seaboard cities. The principal rivals of New York, thus confronted with the necessity of quickly overcoming the Appalachian barrier, all considered at first that technological monstrosity, a canal over mountains. But there was an alternative: the railroad, primitive and uncertain as it was in 1825, could conceivably solve the problem. The choice was a difficult one. Should they use the tried and tested canal method in a completely unsuitable geographic situation or should they turn to the new and untried? Should they imitate or innovate? It is of particular interest that each city reacted differently: Philadelphia adhered as closely as was technically possible to the canal method, Baltimore chose immediate construction of a railroad, and Boston delayed until the technical development of the railroad elsewhere had proved its practicability.

The thesis is as follows. Certain conditions were closely similar for all the cities--the geographical situation, the available technical information, and the intense desire for a modern transportation line to the west. Despite these conditions in common, each city behaved differently. Therefore the differences in behavior must have been caused by residual factors--principally, difference in attitudes toward uncertainty and delay.

In the Introduction, it is demonstrated that the small differences in geographical situation and available information cannot account for the differences in the decisions. Differences in attitudes toward the uncertainty connected with the railroad and differences in the ability to accept delay in a threatening situation are discussed in connection with the difficulties of rational behavior under conditions of great uncertainty. The Introduction ends with a discussion of the advantages of the comparative method as applied to similar cities and regions of the early nineteenth century in order to isolate differences in attitudes.

Part I, on Pennsylvania, attempts to demonstrate that the canal decision of 1826 was an avoidable mistake involving serious consequences for the economic development of Philadelphia. A chronological description of events is followed by an analysis of the factors that determined

the decision, as revealed in the year-long railroad-canal debate. The decision is attributed in part to a demand for certainty, which seemed to be provided by the great success of the Erie Canal.

Part II, on Baltimore, describes the city's reluctant reliance upon a canal (the Chesapeake and Ohio Canal with a branch to Baltimore) until the sudden decision in 1827 of a group of Baltimore businessmen to project the world's first long-range railroad over mountains. The remarkable daring of this decision is contrasted with the caution of the corresponding Pennsylvania decision. The difference is attributed in part to the willingness of the Baltimore businessmen to risk their own capital, in contrast to the dependence of the Philadelphia business community upon state construction.

Part III, on Massachusetts, describes the events leading to the recommendation of a Boston-to-Albany canal by an official commission, the rejection of the canal, and the delay in construction of a railroad over the mountains until the mid-1830's. This willingness to delay is contrasted with the desperate impatience dominant in Philadelphia and Baltimore. The dissertation ends with a discussion of the possible effects of this kind of behavior upon Boston's long-term economic growth.

Microfilm \$5.50; Xerox \$19.80. 430 pages.

THE ECONOMIC DEVELOPMENT OF THE TEXTILE INDUSTRY IN THE COLUMBIA, SOUTH CAROLINA, AREA FROM 1790 THROUGH 1916.

(L. C. Card No. Mic 60-702)

Fenelon DeVere Smith, Ph.D.
University of Kentucky, 1952

I. Columbia, South Carolina, as a Textile Center

The existence of a great textile industry at Columbia has led to a study of its economic development. The city was founded in 1786 as the capital of South Carolina. The site chosen at the fall line, near the confluence of the Broad and Saluda Rivers, was favorable for manufacturers. River transportation developed but declined with the advent of railroads and highways. Natural resources and practically all the essential materials, except metals, abounded. Too, a mild climate was advantageous. A white population derived from European stocks proved itself capable of textile labor.

II. Pioneer and Small Textile Mills

The earliest cotton mill was built near Stateburg, about thirty miles from Columbia. The claim is made that it was the first Arkwright cotton mill in America.

The Saluda Mill, with 8000 spindles, operated from 1832 until burned in 1884. It experimented with slave and free labor and had many financial and manufacturing problems.

III. Hydro-Electric Power and the Columbia Mills Company

Around 1892 an old navigation canal was converted to a power source. The Columbia Mills Company, capitalized

at \$700,000, constructed a plant with 30,000 duck spindles. Limited space between the canal and the river led to locating the factory on a bluff. The General Electric Company advised on the transportation of power. The solution was the first completely electric mill in the world.

IV. The Whaley Mills and Steam-Electric Power

Between 1895 and 1900, W. B. Smith Whaley and Gadsden E. Shand built four large cotton mills in the Columbia area, as follows:

	Year	Spindles	Capital
The Richland Cotton Mills	1895	26,000	\$ 150,000
The Granby Cotton Mills	1895	57,000	150,000
The Olympia Cotton Mills	1899	100,320	1,500,000
The Capital City Cotton Mills	1900	15,000	100,000

Whaley was an irresistible promoter. He was backed by his wealthy Charleston family. Steam power proved too expensive and hydro-electric power was purchased.

All the Whaley mills were plagued by inadequate fixed capital structures and shortages of working capital. In 1903, northern directors, representing creditor interests, penetrated his boards, and he resigned. The mills struggled on a few years under the leadership of Lewis W. Parker and his consolidated interests. They were purchased by Pacific Mills in 1916.

V. Summary and Conclusion

Columbia, in common with other southern cities, possessed resources which attracted textile manufacturers. Of primary importance were the labor supply, raw materials, climate, transportation facilities, interested entrepreneurs, and water powers. Local financial and banking facilities were not adequate or adapted to the needs of textile manufacturing. This last factor resulted in the financial control of the local textile enterprises by Boston, New York, and Baltimore interests.

Microfilm \$4.65; Xerox \$16.45. 364 pages.

ECONOMICS, THEORY

THEORY AND PRACTICE IN THE COFFEE FUTURES MARKET

(L. C. Card No. Mic 59-5151)

Edward C. Atwood, Jr., Ph.D.
Princeton University, 1959

This investigation has the dual aim of examining current commodity market pricing theory in relation to the actual conditions present in the coffee market; and to judge the effectiveness of the New York Coffee and Sugar Exchange as a medium for the transference of the risk of price change through hedging.

On the basis of a complete theory of commodity market pricing as developed by Keynes, Hicks, Kaldor, Dow, Blau,

and Working, and a development of the actual pricing conditions in the coffee market, the following conclusions are offered:

1. the assumptions made in the theory as to the parallel movement of the spot price, the futures price, and the prices of other grades of the commodity does not accord with the facts in the coffee market. Spot prices, futures prices, and the prices of other grades of coffee seem to move in somewhat erratic ways, and on occasion in opposite directions.

2. the futures contracts trades on the coffee market are two in number. In one the deliverable grade is defined too broadly to engender much trade, and in the other it is defined so narrowly as to make corners possible.

3. there is a distinct possibility that market manipulation will occur in the coffee market because of the lack of adequate rules and lax enforcement. This coupled with the relative inactivity on the market tends to make a hedging contract precarious.

4. while the theory assumes that hedgers and speculators are separate traders, and that hedgers automatically hedge stocks, this is not the case on the coffee market. Hedgers and speculators are the same traders, hedging from very definite price expectations only when they believe the market conditions are favorable, and at other times holding considerable unhedged stocks. One large group of stock holders, coffee roasters, make no use of the facilities of the Exchange at all.

5. the theory can not explain the persistent discount found in the coffee market. The only theoretical case allowing discounts requires that the expectation be that prices will remain constant, yet the discount in the coffee market persists even when the expectation of a Brazilian devaluation, is not taken into account in the theory.

On the basis of the great differences that are apparent between the theoretical model and the actual market it must be concluded that the theory has no relation to the actual pricing process in the coffee market. The theory assumes a perfectly competitive market while the coffee market is very far removed from such a condition. The narrowness of the market due to the lack of hedging interest, the real possibility of price manipulation, the unfavorable change in basis, and the persistent discount do not accord with the theoretical model. This is very largely due to conditions assumed in the theory but not present in the actual market.

The effectiveness of hedging in the coffee market must be deemed to be very low. The lack of price parallelism, coupled with the narrow market, the distinct possibility of price manipulation, and the unfavorable basis change would make an automatic hedge a very precarious transaction indeed.

Unfortunately both of the conclusions reached by this investigation are necessarily negative:

1. current commodity market pricing theory can not explain, or even approach an explanation of the pricing situation found in the coffee market.

2. The New York Coffee and Sugar Exchange cannot now, and probably never will be able to efficiently perform the major economic function assigned to commodity markets - the transfer of the risk of price change through the medium of hedging.

Microfilm \$3.40; Xerox \$11.60. 264 pages.

THE ECONOMIC PREDICTIONS OF
KARL MARX: AN EXAMINATION OF
MARXIAN ECONOMIC THEORY.
(Books I and II).

(L. C. Card No. Mic 60-464)

Fred M. Gottheil, Ph.D.
Duke University, 1959

Supervisor: Joseph J. Spengler

The dissertation critically examines Marx's predictions as logical derivatives of his economic system. During the course of his creative years (1843-83), Marx produced not only a prodigious quantity of economic, political and historical volumes, essays, pamphlets, articles, addresses and correspondence, but set down in these writings a multiplicity of prophecies which ranged from quite abstract and general predictions concerning movements of the capitalist economy to very specific forecasts relating to future occurrences of specifically timed and spatially located events. The source of all his predictions, Marx claimed, was to be found in the "universal laws" which govern social evolution. The formulation and exposition of these laws, which is essentially the intent of Marx's major treatise, *Capital*, constitutes the Marxian economic system or model. Marx's justification for calling his analysis "scientific" is based upon his claim to have derived the predictions through the use of his economic model. Although the Marxian prognostications deal with political, social, and military events as well as with economic matters, Marx was primarily interested in the future developments of the international economy, particularly, in the future development of the capitalist system. The economic organization under communism, the purported successor to capitalism, received brief and only incidental consideration at his hand.

Marx's primary economic predictions concern the development of the capitalist economy. Included among these predictions are the continual decline in the rate of profit, the geographic extension of the capitalist mode of production, the development of the international market, the centralization of wealth and production, the increasing misery of the proletariat, and the inherent instability of the capitalist economy. An assessment of these predictions as logical derivatives of his economic model reveals three major shortcomings, viz., the assumptions underlying his prophecies are sometimes contradictory, his analysis, in many instances, remains incomplete, and the logic with which he derives the predictions from his model is, in crucial circumstances, defective. Considering briefly the latter shortcoming, Marx as a rule constructs economic theorems from the assumptions he posits in his model and upon these theorems forecasts the transformation of the capitalist system. The critical defect here, it was found, is the logically faulty construction of these theorems. Only under certain specified conditions do his predictions become tenable, but it was found Marx had failed to establish these conditions as an integral part of his economic model.

Marx's political predictions concerning the future development of the capitalist system include the inevitability of class struggle, the evolution of a sequence of proletarian revolutions, the eventual conquest of political (ruling) power by the proletariats, and the institution of a

revolutionary dictatorship of the proletariat. The validity of these predictions is contingent upon the development of the capitalist economy, i.e., the tenability of his economic prophecies, and upon the assumption of class consciousness which he relates to increasing class antagonism. Given the tenability of his economic forecasts, his political prophecies, it was found, may be inferred from his model. It has been demonstrated, however, that Marx's economic predictions do not follow logically from his model, and in this sense, his political prophecies must be considered as being scientifically baseless.

An evaluation of Marx's predictions concerning the future communist state reveals a conspicuous absence of any attempt on his part to establish these predictions as logical resultants of his system. They appear, in almost every instance, as mere, although interesting conjectures.

Microfilm \$4.35; Xerox \$15.30. 340 pages.

PRICE FORMULATION AND PRICE BEHAVIOR IN
THREE HEAVY MANUFACTURING INDUSTRIES

(L. C. Card No. Mic 60-753)

Winfield Travis Hutton, Ph.D.
The Ohio State University, 1959

The pricing process and cyclical variations in price and price-determining variables are analyzed in the steel, automobile, and rubber tire industries to determine the relative effect of demand- and cost-oriented factors upon price in these industries. In addition, the public policy implications of administered prices are examined.

The relative importance of the various price-associated factors is revealed by the coefficients of correlation between the cyclical residuals of the nineteen price, cost, and output time series studied. As trend and seasonal variations are removed prior to the correlation analysis, the conclusions apply strictly to the intermediate run.

This correlation analysis revealed that the price effect is relatively minor. The price-quantity correlations are -0.18, -0.22, and +0.60 for steel, automobiles, and tires, respectively. The income effect is much more pronounced. Over the cycle, steel, automobiles, and tires exhibit correlations with GNP of +0.83, +0.76, and +0.09, respectively, and +0.45, +0.77, and +0.48 with personal consumption expenditures on durables.

Cost-price relationships over the cycle (with trend removed) are much closer than demand-price associations. Among cost components, there is a closer association between raw materials costs and product prices than between wages and prices. In the automobile industry, the correlation between steel and automobile prices is +0.71, but it is only +0.06 between automobile wages and prices.

There is a very high association between wages in the three industries. Automobile wages exhibit a correlation of +0.65 with steel wages and +0.75 with wages in the tire and tube industry. Steel wages show a correlation of +0.77 with tire and tube wages and +0.65 with automobile wages. An important reason for these high correlations appears to be a rivalry between union leaders wherein each endeavors to secure a more favorable wage settlement for his union than was previously secured by other leaders for their unions.

From the standpoint of public policy, the existence of administered prices does not seem undesirable. They provide a stable basis for the formulation of purchase decisions, and their stability also discourages the postponement of such decisions. Hence, they have a positive antirecessionary effect. This is evidenced by the shortness of the 1957-58 recession, during which the price level stabilized rather than declined.

The effect of slowly rising administered prices can actually be favorable to economic growth if the price level does not rise as rapidly as productivity. In this study, the rate-of-change-in-trend parameters of the output series indicate a significantly steeper growth than the corresponding parameters of the price series. Such a gently rising price level spurs growth in that it provides an inducement to buy now rather than wait until later when price will almost certainly be higher.

Although the existence of administered prices can be beneficial to economic activity, the level of administered prices might be made competitive through the fostering of "multilateral rivalry." This requires a judicious public policy toward merger and divestiture aimed at ensuring (1) that the large firms in the industry are relatively equal in economic power and (2) that a substantial portion of the industry output is sold in markets where the buyers are at least as powerful as the sellers.

Microfilm \$4.90; Xerox \$17.35. 381 pages.

AUSTRIAN ROMANTIC SCHOOL. ADAM MUELLER, SPANN AND THE PRESENT UNIVERSALISTS.

(L. C. Card No. Mic 60-357)

Desider Viktor, Ph.D.
St. Louis University, 1959

This dissertation surveys the development of romantic political economy as represented by Adam Mueller, Spann and his universalistic school.

Romanticism in economics represents a certain degree of nationalism. It emphasizes the importance of cultural values and of productive forces.

Adam Mueller, the leader of the early nineteenth century romanticists, followed a conservative social philosophy. He believed in political absolutism and was one of the first critics of classical economics. His stormy life influenced his peculiar doctrines. Despite serious shortcomings, he had some valuable ideas (for example, the concept of immaterial capital, the romantic theory of

taxation and of factors of production as well as his sociological interpretation of the concept of money).

Spann's scheme is distinct from that of the old romanticists. He introduced a wide range of contemporary doctrines into his universalistic system. Spann was influenced by Plato, Aristotle, the German mystic, Meister Eckehart, St. Thomas Aquinas, German idealism and Adam Mueller's ideas. He criticized empiricism, positivism, materialism and individualism. Aristotle's concept of the "whole" is especially noticeable in his doctrines, and his corporate economy reflects the preference of the scholasticists for an organized society.

Spann's intention is to revolutionize economic theory. His economy is of a purposive type. The economy is a system of means for ends. The ends determine how to manipulate the economic process. His economics is based on a holistic view. Factors of production are replaced by the "performing elements" which grow into an articulated structure. Marginal utility is discarded, and the theory of equal importance is substituted for it. Spann's doctrine is based on an objective foundation. In his organic and functional price theory, price becomes an expression of the ramification of the whole.

Although Spann did not succeed in revolutionizing economic theory, he established a school and had a certain success with it. As an economist Spann represented, long before Keynes, a broad macro-economic approach. He believed that classical economics could not solve the problems of the twentieth century and advocated radical changes to remedy the situation. His sociological and functional approach, the theory of national assets and the concepts leading to the socio-economic balance sheet can be regarded as contributions.

Among Spann's shortcomings one can list his over-ambitious effort to rebuild economics on a completely new foundation, his extreme idealism, and the oversimplification that the remedy is an organized functional society.

Spann's disciples represent one of the most persistent schools on the European continent. The best known members of this universalistic school are Heinrich, Andrae, Baxa, Ottel, Tautscher and Westphalen. They emphasize the importance of the applied economics without modifying Spann's doctrines. Their objective is a corporate economy, without planning, based on a functional, pluralistic society. Heinrich, the present leader of the school, is confident that the corporate system could be adopted to changing conditions. He believes in a flexible approach and tries to eliminate the rigidity of his master's scheme.

In general, universalist economists hopefully try to prove the advantages of their socio-economic order as a third system between crisis-ridden capitalism and brutal communism. Microfilm \$4.25; Xerox \$15.10. 332 pages.

EDUCATION

EDUCATION, GENERAL

AN EXAMINATION OF RESIDENCE HALL COUNSELING PROGRAMS FOR MEN IN TEN SELECTED MIDWESTERN COLLEGES AND UNIVERSITIES

(L. C. Card No. Mic 60-418)

Gary Robert Anderson, Ph.D.
Northwestern University, 1959

Adviser: Professor Frank W. Miller

The purpose of the study was twofold. First, the study attempted to analyze residence hall counseling organization in order to establish those principles and practices that seem indigenous to stable programs. Secondly, it was hoped that the findings in the study would serve as a guide to schools that desire to initiate residence counseling programs or wish to examine their present program.

The residence hall counseling programs for men in ten selected Midwestern colleges and universities were examined to ascertain the following factors: counselor selection procedures, counselor qualifications, counselor advisory responsibilities, counselor supervisory responsibilities, counselor training, other counselor responsibilities, internal organization of the residence hall, administrative organization of the total personnel program, counselor salary and general benefits, counselor evaluation, residence hall philosophy, future plans for the residence hall program, and miscellaneous information about the residence hall counseling program.

The ten schools in the study were selected by a committee of six professionally active persons in the student personnel field. The schools included, Beloit College, Beloit, Wisconsin; Carleton College, Northfield, Minnesota; DePauw University, Greencastle, Indiana; Knox College, Galesburg, Illinois; Lake Forest College, Lake Forest, Illinois; Lawrence College, Appleton, Wisconsin; Monmouth College, Monmouth, Illinois; Ripon College, Ripon, Wisconsin; St. Olaf College, Northfield, Minnesota; and Valparaiso University, Valparaiso, Indiana.

The data in the study was gathered through the use of a questionnaire and a personal interview conducted on each campus with the Dean of Men or the Dean of Students. These visits allowed each personnel dean to understand fully the nature of the project and to answer questions in greater detail.

The following major conclusions were drawn from the data.

(1) Counselors are most often selected by the personnel dean who relies primarily upon his personal knowledge of the applicant. A personal interview is the most widely used selection technique.

(2) There is no common agreement as to the importance of high academic grades as a qualification for counseling. Interest in counseling and experience in group work is considered very important.

(3) The counselor's role as an adviser and a supervisor varies from school to school. Each college, however, expects their residence counselors to involve themselves in some way in these areas.

(4) Although all of the schools in the study involve their residents in dormitory program planning to some extent, very little "self-rule" is given by the colleges to the students.

(5) The organization of the personnel services at the schools is often very simple and direct. Most of the colleges have small student personnel staffs.

(6) Remuneration for residence counseling is often rent-free room or the equivalent in cash.

(7) Most of the schools state that they have a philosophy of residence hall living, but only one college has formalized a philosophy in writing.

(8) Weaknesses pertaining to the counseling program that were most often mentioned include: a lack of communication between faculty and student personnel services; the counselors inability to properly see their counseling role; poorly trained Head Residents; and fraternity competition with dormitory programs.

Microfilm \$2.50; Xerox \$7.00. 150 pages.

AN ANALYSIS AND THE ESTIMATED REVENUE FROM CERTAIN NONPROPERTY SCHOOL TAXES IN THE GULF COAST AREA OF TEXAS

(L. C. Card No. Mic 60-118)

William Gerald Barber, Ed.D.
University of Houston, 1959

Problem. This study was made to determine the amount of revenue that the Legislature of Texas could make available for public schools in nineteen counties within a one hundred mile radius of Harris County by enacting legislation permitting school districts, counties, or groups of counties to assess and collect taxes on selected nonproperty items. Specific problems investigated are as follows:

(1) the gross yield of specified local nonproperty taxes by county and by region, (2) comparisons between the gross yield of certain nonproperty taxes and county property taxes, based on per capita and pupils in average daily attendance in each county, (3) whether the selected nonproperty taxes might best be administered by school districts, counties, or groups of counties.

Procedures. The investigator examined all available literature related to nonproperty taxes in other states in order to determine the nonproperty taxes being used for local revenue and the frequency of their use. Two basic assumptions were made by the investigator. The assumptions were: (1) there was a need for additional revenue for schools in the Gulf Coast Area of Texas, and (2) the Legislature of Texas would make local nonproperty taxes

available to school districts, counties or regions. The local nonproperty taxes being used with the greatest frequency were evaluated by three criteria arbitrarily selected by the investigator. The three criteria were: (1) productivity of the source, (2) uniformity of range per capita and per pupil in average daily attendance between counties, and (3) ease of administration. After the selected nonproperty tax sources had been measured by the criteria a thorough investigation was made of each tax source considered by the investigator to be applicable to the Gulf Coast Area.

Findings. Three local nonproperty tax sources were found to meet the criteria established by the investigator. They were: (1) local retail sales and compensating use taxes, (2) a local motor vehicle tax based on a percentage of the state registration fee, in lieu of the present property tax on vehicles, and (3) gross-receipts taxes on public utilities. Further investigation revealed that a 2 percent tax on retail sales, exempting food, would produce revenue approximately equal to that now received from county property taxes. It was also found that the sales tax would be best administered on a regional level. Use taxes are used in conjunction with the retail sales tax at the same rate of assessment. A local motor vehicle tax assessed at a rate of 25 per cent of the state registration fee in lieu of the present personal property tax on vehicles would produce approximately 12 per cent of the local county property tax. The yield of a motor vehicle tax would be uniform when based on per capita and pupils in average daily attendance between counties. The motor vehicle tax was found to be most applicable on a county basis. The local tax on gross receipts of public utilities levied at a 2 per cent rate would produce approximately 5 per cent of the local county property tax yield. It was found to be the most uniform of the three major local tax sources considered, and could best be applied on the local school district level. Local payroll taxes and local manufacturing taxes were found to be productive sources of revenue but did not meet the criteria of uniformity or equitability of administration. Such local nonproperty tax sources as amusement tax, liquor tax, race track and gambling taxes were found to be restricted to certain areas and not feasible in the Gulf Coast Area of Texas.

Implications. If the findings of this study are supported by enough evidence to be logical conclusions, the local property tax is being sorely pressed to meet the increasing cost of education in the Gulf Coast Area of Texas. It follows then that local school districts must consider additional sources of revenue. The combined local tax revenue from the sources considered in this study would more than double the present local tax revenue of public schools in the nineteen counties.

Microfilm \$2.50; Xerox \$5.40. 106 pages.

AN INQUIRY INTO THE OPERATIVE PRINCIPLES APPLICABLE TO THE LICENSING OF MOTION PICTURES IN NEW YORK STATE

(L. C. Card No. Mic 59-6236)

Samuel Beckoff, Ph.D.
New York University, 1959

Three decisions of the United States Supreme Court in 1952-1953 implied that the motion picture was no longer merely entertainment, but a mature medium of communication, and thus entitled to the "freedom of the press" protection of the First and Fourteenth Amendments. The decisions further tended to cast doubt on the operative principles then being applied by all six state censorship boards (Kansas, Maryland, New York, Ohio, Pennsylvania and Virginia). By 1955, only the Maryland, New York and Virginia censorship boards remained.

On the assumption that some form of film censorship would continue, especially in New York State, if the modification of the present operative principles could be effected, such a continuing effort to formulate a censorship statute in terms of the various recent Supreme Court decisions is examined in the light of the history and origins of the operative principles of the New York State group.

Subsequent sections of the paper cover the critical decisions themselves, and some possible alternatives to governmental censorship: self-regulation (the Production Code of the film industry); social pressure groups (e.g., the Legion of Decency); or a film classification system. The public interest, in relation to the social, psychological and constitutional aspects of censorship, is also discussed.

The final sections are concerned in part with the conclusions reached, and with some specific recommendations addressed to the public, the government, and the film industry. In the main, official censorship is held to be undesirable historically, ideologically, and constitutionally. However, for the present, the public interest appears to demand some limited form of film censorship; at least, until such time as the withering away of film censorship can be consummated "with all deliberate speed."

During the transition between limited state censorship and ultimately no censorship at all, it is recommended, in part, that:

1. The film industry develop and adopt a more progressive program of film-making to exploit more mature themes; to make more specialized films designed to instruct as well as to entertain (the equivalent of the "public interest" programs now required of radio and television by the Federal Communications Commission); and to continue reducing the annual total number of films made in view of the ever-declining demands of the obsolescent double-feature program. (In the long run, nothing will contribute as much to the improved moral, financial -- and constitutional -- health of the films as good films). As with the classics, the censorship-minded will quibble less about what is, or is not offensive, if the general quality of the product is high.

2. The public should continue to press for enlightened, politics-free censorship, but should continually advocate the abolition of film censorship at the earliest date consonant with the public interest and the public safety.

3. The legislature of New York State should accommodate the transitional period by (a) establishing a permanent advisory board to periodically review and revise

the basic operative principles of the Motion Picture Division, and, (b) permit the Division to avail itself of outside expert opinion when faced with the problem of reviewing an exceedingly difficult or controversial film.

In brief, the government, as well as the public and the film industry -- and all other social segments concerned -- should view the extant censorship system as a declining organism; the censors, especially, should conduct themselves in a most enlightened, even permissive, manner, and invite, rather than interpose, any further constitutional tests of its operative principles. The censors, in fact, should be the first to try to educate the public away from a need for censorship, and toward the use of discrimination and artistic (as well as moral and esthetic) acumen.

Microfilm \$5.10; Xerox \$18.00. 397 pages.

**A STUDY OF THE VALUES OF CATHOLIC
HIGH SCHOOL STUDENTS OF DIFFERING
SOCIO-ECONOMIC BACKGROUNDS AND
THE RELATIONSHIP OF THESE VALUES
TO THOSE OF THEIR PARENTS**

(L. C. Card No. Mic 60-329)

Sister Mary Vera Del Grande, O.S.U., Ph.D.
St. Louis University, 1959

This study is an investigation of the general pattern of attitudes of parents and children, of boys and girls, and of sophomores and seniors toward specific values in the light of socio-economic background. The population consisted of 1,390 students from seven Catholic high schools of an East Central state in the United States. These 1,390 students were paired with their own parents in order to determine whether there is any significant correlation between the attitudes of parents and those of their own children.

Separate but parallel questionnaires for parents and their children were constructed, consisting of seventy-one items belonging to the following seven values, which were considered basic to a true and ideal system of values, as gleaned from the objectives of Catholic secondary education: 1) Belief in God; 2) Belief in the Dignity of Each Individual; 3) Democracy and Freedom; 4) Integrity; 5) Responsibility; 6) Marriage, Family, Divorce; and 7) Leisure, Dating, Dress, Places.

The following conclusions were drawn from the data:

1. The Pearson Product-Moment coefficients of correlation were low for all values, except value two, Belief in the Dignity of Each Individual, thus indicating that, for this population, there is some dissimilarity between the attitudes of parents and of their own children, except for value two, where less disagreement was noted.

2. An analysis of individual items reveals that some class differences do emerge. The most favorable attitudes toward value one, Belief in God, and value two, Belief in Each Individual, are held by lower social class parents and children; the most unfavorable attitudes, by upper social class parents and children. For the five remaining values, the most favorable attitudes are held by upper social class parents and upper and middle social class children; the most unfavorable attitudes, by middle social class parents and lower social class children.

3. There are no great variations in attitudes among the girls from each social class level, nor among the boys from each level, but girls, in general, manifest considerably more favorable attitudes toward the values under consideration than do the boys.

4. The data indicate that seniors hold slightly more favorable attitudes toward the values than do sophomores with only slight differences among the seniors on each social class level and among the sophomores on these levels.

5. The differences in means in values concerning Belief in God, Democracy and Freedom, Integrity, and Responsibility are slight, thus indicating that these students tend to behave somewhat as they have expressed their beliefs. In values concerning Belief in the Individual; Marriage, Family, Divorce; and Leisure, Dating, Dress, and Places, the differences in means between what the student believes and what he feels he might do in an actual situation are greater.

The data reveal that while the majority uphold the ideal responses to total values, there is a minority who deviate from the ideal responses in the case of individual items. It is in these weak areas that Catholic education can work realistically to present ideal, unchanging values in such a way that the student will choose them for their intrinsic worth and accept them as the basis for his actions in a world of conflicting cultural standards and shifting values. Microfilm \$5.80; Xerox \$20.50. 454 pages.

**COMPARISON OF THE MALE VOICE
BEFORE, DURING, AND AFTER MUTATION.**

(L. C. Card No. Mic 60-390)

Robert Carl Ekstrom, Ed.D.
University of Southern California, 1959

Chairman: Professor Rush

The purpose of the study was to determine the extent of relationships among the characteristics of the male voice before, during, and after the adolescent change of voice. The voices of 213 boys at East Junior, Ordean Junior, and East Senior High Schools of Duluth, Minnesota, were recorded on tapes at various stages of their voice cycle. Recordings were made of the voices before the change of voice, during the change, and after the change of voice. All the boys were in junior high school at the start and nearly all were in high school at the finish. The recordings were taken over a three-year period. The tapes were played through an oscilloscope and pictures were taken of the wave lengths at various stages enabling the comparison of the preadolescent, adolescent, and postadolescent stages by sight.

Judges rated agility, flexibility, and quality. Range, break, and tessitura were checked by a piano. Results were categorized and placed in contingency tables. The degree to which the voices differed at various stages in each category was determined by use of the chi-square method, and correlations were computed by use of the coefficient of contingency technique.

Other aspects treated were the age of the boy at the time of voice change, cambiata concept, falsetto singing,

register, danger of using the soprano voice too long, effects of "break," speed at which a boy's voice matures, advisability of singing while the voice is breaking, results of singing during the change of voice, value of singing during adolescence, symptoms by which a teacher can recognize beginning change in voice, and speculation as to the future character of a boy's voice.

Results. The investigation disclosed statistically significant correlations in the relationships of certain characteristics of the male voice before, during, and after the adolescent change. It was found that the range of the unchanged voice of the boy is related in such a manner that if a boy had a high voice when his voice was unchanged, he usually had a high voice when his voice was changed. If he had a low unchanged voice he most often sang with a low changed voice. Of the 213 boys there were 59 first sopranos, 55 second sopranos, and 99 altos. Fifty-eight per cent of the first sopranos became tenors, 20 per cent became baritones, and 22 per cent became basses. Forty-seven per cent of the second sopranos became baritones, 24 per cent became tenors, and 29 per cent became basses. Sixty per cent of the altos became basses, 19 per cent became tenors, and 21 per cent became baritones. Thus, most of the first sopranos became tenors, the greatest share of the second sopranos became baritones, and most of the altos became basses. Computation of chi-square revealed a significant correlation. Coupled with the findings that the "breaks" at middle c' were nearly always made by basses, that baritones "broke" at e' most frequently, and tenors at f sharp' or g', there is good evidence that the future voice of a boy can be predicted to some extent. If an alto began to show trouble at middle c' he would more often than not become a bass.

The correlation was quite high between unchanged voice quality and voice quality of the changed voice. If a boy's voice was light before the change it was invariably light after the change.

All compared aspects revealed definite correlations except that of tessitura before the change and tessitura during the change.

Microfilm \$3.55; Xerox \$12.40. 275 pages.

A SURVEY AND EVALUATION OF MUSIC PERFORMED IN PUBLIC CONCERT BY INDIANA HIGH SCHOOL BANDS

(L. C. Card No. Mic 59-6578)

Marvin Wendell Fjeld, Ed.D.
Indiana University, 1959

Chairman: Shirley H. Engle

Statement of the Problem

The problem of this study was to determine the musical quality of the band literature being performed by Indiana high school bands, and, further, to determine what factors influence the quality of music played by Indiana high school bands.

Procedure

In carrying out this study, the following steps were taken:

1. Each high school band director in Indiana was asked to submit a program of the main public concert presented by his band during 1955-1956.

2. Each high school band director in Indiana was asked to complete a questionnaire concerning factors that might affect the selection of band literature.

3. A jury of experts was selected to evaluate the selections appearing on programs presented by Indiana high school bands.

4. Ten main criteria for determining the quality of band music was selected by the jury from a list of thirty evaluative criteria. The thirty criteria were based on a review of related literature, conferences with high school band directors, and suggestions by jury members.

5. Jury members rated each selection subjectively above average, average, or below average, and indicated whether or not that selection met each of the ten evaluative criteria.

6. Validity of the evaluative criteria was computed by means of the chi square technique.

7. The degree of relationship between responses to questionnaire items and quality of music played was computed by means of the chi square technique.

Findings

The 10 evaluative criteria receiving the highest mean ratings by the jury were:

1. Composition has form, structural unity, and coherence.
2. Music fits medium through which it is expressed; appropriate to band idiom.
3. Composition is challenging and interesting to the student.
4. Study of the piece will intensify musical interests, lead to a deeper musical appreciation.
5. General development of the theme or idea of the composition is good. "Goes someplace" and "does something" musically.
6. Piece was written by a musical scholar of depth. Work is an honest approach, generally sincere and eloquent; lacks artificial tricks.
7. Composition will stand up under prolonged and meticulous rehearsal.
8. Piece gives listener an emotional experience, a feeling of completeness, satisfaction. Emotional implications are understandable to the hearer.
9. The best use is made of the various instruments; good voicing in sections and as a whole.
10. Good arrangement, well scored and well balanced; not scored too heavily.

A total of 1,273 selections appeared on the 461 programs analyzed. The selections evaluated, those performed in concert by 13 or more Indiana high school bands, constituted four per cent of the selections tabulated.

The entire jury gave 370 A ratings (33 per cent of all ratings), 467 B ratings (42 per cent of all ratings), and 281 C ratings (25 per cent of all ratings).

It was found by means of the chi square technique that a positive relationship exists between the ten evaluative criteria and the basis used in classifying selections above average, average, or below average.

Conclusions

1. Experts agree on the importance of most criteria used in the selection of high quality music.

2. Much of the music played by Indiana high school bands is not of high quality as rated by experts.

3. Highest quality music seems to be selected by directors who:

- a. have spent the most time in the field of music education,
- b. have the largest band libraries,
- c. have the largest budgets for new music,
- d. are employed in the largest schools,
- e. direct the largest bands,
- f. use the fewest students from grade 8 and below,
- g. rehearse most frequently,
- h. have the longest rehearsals,
- i. present the most concerts.

Microfilm \$2.75; Xerox \$9.70. 212 pages.

THE USE OF INDIGENOUS INFORMATION TO IDENTIFY POTENTIAL OVER- AND UNDER-ACHIEVERS.

(L. C. Card No. Mic 60-428)

Aubrey Lester Forrest, Ph.D.
Northwestern University, 1959

Adviser: Dr. Frank Miller

The basic problem dealt with in this dissertation is that of identifying potential over- and under-achievers for college admission and counseling purposes. Over-achievers are defined as those students who achieve a significantly higher grade point average during their freshman year than was predicted by their Scholastic Aptitude Test verbal scores and/or their high school rank in class. Under-achievers are defined as those who achieved a grade point average during their freshman year which was significantly lower than that predicted by these two predictor variables.

Three major assumptions are made in this study. The first assumption is that it is desirable to identify, prior to their entrance into college, those students who will achieve significantly higher or lower than would normally be expected on the basis of their SAT verbal scores and/or high school rank in class. The second is that the factors contributing to over- and under-achievement differ from college to college and that, therefore, it is desirable for an efficient method to be found or formulated which can be used by a "typical" student personnel worker in utilizing indigenous information for such identification purposes. The third is that the type of method which would possess the highest degree of validity and reliability for such identification purposes would be that of constructing an objective instrument which has been validated for the specific institution in question.

On the basis of these assumptions, a survey of the ideas of selected experts in the field of objective test construction is presented. These ideas are evaluated on the basis of their usefulness to a typical college student

personnel worker in a typical working situation. A specific methodology is proposed and tested by utilizing it to partially construct an objective instrument for use in identifying potential over- and under-achievers at Northwestern University.

The implications of the instrument are discussed and the needs for further research in the area are pointed out.

The implications are that twenty-three items have been constructed which hold significance for identifying potential over- and under-achievers at Northwestern University, that for the Northwestern situation the number of discriminating items can best be expanded by relating future item construction efforts to eight specific personality factors, and that the methodology proposed best meets the criteria of a typical college student personnel working situation.

Microfilm \$2.50; Xerox \$7.20. 154 pages.

A STUDY OF THE BEGINNING AND END POINTS OF THE ADOLESCENT CYCLE OF GROWTH IN HEIGHT, SKELETAL AGE, AND MENTAL AGE OF EIGHTY-FOUR GIRLS OF THE THIRD HARVARD STUDY.

(L. C. Card No. Mic 60-537)

Charles Martin Greenshields, Ph.D.
Michigan State University, 1958

Major Professor: Dr. C. V. Millard

The purpose of this study was to examine the relationships between growth in height, skeletal age, and mental age in the adolescent cycle of growth at the beginning, at the end, and further, to examine the relationships between the beginning and end points of the adolescent cycle of growth in each of the three growths. The rates and incipencies of both the adolescent and pre-adolescent cycle were examined to demonstrate the individuality and concordance of growth of the individual.

For this study, eighty-four girls were selected from the Harvard data. Courtis equations were computed, describing two cycles of growth, for the three aspects of development in order to determine the rates, incipencies, beginning points and the end points for each.

Product moment coefficients of correlation were computed to discover the degree of relationship between the beginning points of growth in the adolescent cycle; the end points of growth in the adolescent cycle; and the beginning and end points of growth in each of the three growths. The following hypotheses were tested:

1. Beginning times of the adolescent cycle in height, skeletal age, and mental age would show a statistically significant relationship with each other. This hypothesis was not supported.
2. End points of the adolescent cycle in height, skeletal age, and mental age would show a statistically significant relationship with each other. Except for the relationship between height and skeletal age, this hypothesis was not supported.
3. The correlations at the beginning time of development in adolescence would be larger than the correlations at the end point of the cycle. This hypothesis was not supported.

4. The correlation between the beginning point and the end point within a growth would be statistically significant for all three growths. This hypothesis was supported. In height the relationship was positive and in skeletal age and mental age the relationship was negative.

To demonstrate concordance of growth a test of the significance of the differences, using a non-parametric statistic, was done on the rates and incipencies of the three growths. The following hypothesis was tested:

1. The variance between height, skeletal age, and mental age within the individual would not be statistically significant in terms of:

- a. rates of development in the pre-adolescent cycle; (This was supported.)
- b. rates of development in the adolescent cycle; (This was not supported.)
- c. incipencies of the pre-adolescent cycle; (This was supported.)
- d. incipencies of the adolescent cycle; (This was not supported.).

Within the limitations of this study, it was concluded that no relationship exists between the beginning points of the adolescent cycle of growth in height, skeletal age, and mental age. This was also the case for end points of growth in height and mental age, and skeletal age and mental age. However, a relationship was found to exist between the end points of growth in height and skeletal age.

A statistically significant, positive relationship was found between the beginning and end points of growth in height. The relationship between the beginning and end points for both growth in skeletal age and mental age was found to be statistically significant, but the relationship was negative.

A Chi-Square test of the significance of the differences revealed that within the individuals neither the rates nor the incipencies of the three growths were significantly different for the pre-adolescent cycle. Both the rates and the incipencies of the three growths in the adolescent cycle were found to be significantly different within individuals. Microfilm \$2.50; Xerox \$6.20. 130 pages.

A COMPARATIVE STUDY OF BOOKKEEPING PRINCIPLES AND ACTIVITIES USED ON THE JOB AS PRESENTED IN TEXTBOOKS AND BY TEACHERS

(L. C. Card No. Mic 60-664)

Martha Frances Hill, Ed.D.
University of Kentucky, 1954

In this study the degree to which bookkeeping principles and activities used by office workers on the job are presented to high school bookkeeping texts and by high school teachers of bookkeeping was determined.

The following are the principal findings and conclusions of the writer as a result of this study.

Principles and Activities Performed in the Business Office

1. The office worker who handles the bookkeeping for the business office performs many activities other than bookkeeping.
2. The preparation of financial statements is frequent.
3. The keeping of journals and ledgers is a regular practice.
4. The keeping of records for tax purposes is common.
5. Records kept in connection with activities rank at the top in frequency of mention.

Principles and Activities Presented in the Textbooks

Generally, the principles and activities mentioned frequently by the office workers are presented in more of the texts than those mentioned less frequently.

Principles and Activities Presented by the Teachers

1. Teachers are presenting a majority of the principles and activities that are used by office workers.
 2. By comparison, the teachers are covering more principles and activities than the textbooks are.
 3. The teachers are in some agreement with the principles and activities omitted from presentation in the textbooks. Of the 23 items given by none of the textbooks, only one was taught by more than half of the teachers. The others were taught by from 3.32 per cent to 44.5 per cent with only two ranking as much as 40 per cent in presentation.
 4. North Carolina, Kentucky and Georgia rank very low in presentation by the teachers of records kept for tax purposes. Kentucky, North Carolina and West Virginia rank very low in the activity connected with the use of the cash register.
 5. The teachers gave a number of reasons for not teaching the 174 selected principles and activities included in the questionnaire.
- The three most popular reasons given are: "Not presented in the textbook," "Do not have time in one year," and "Too advanced for first-year bookkeeping."

Conclusions

1. It would appear that textbooks should present more of the principles and activities used by workers in the business office since they mention only 50 per cent of them.
2. Two of the specific areas that need to be emphasized by the textbooks are the records kept for taxes of various kinds and the work done in connection with banking activities.
3. The teachers should emphasize the type of records kept by small businesses, for example, one in which the combined cash journal is the only journal used.
4. The teachers should teach the principles and activities used in keeping tax records. Teachers in the schools of North Carolina, Kentucky and Georgia particularly should give more attention to this type of information than they now do.
5. It is indicated that more instruction is needed in

the use of the cash register, the adding machine, and the calculating machine.

6. The textbooks and teachers present more of the principles and activities ranking in the first quartile of the total 174 items than in the lower ranking items.

7. Since the teachers and the textbooks agree on omission of several top-ranking principles and activities, perhaps some effort should be made to learn whether or not they should be learned in the classroom or on the job.

8. Since sampling of the high school teachers of book-keeping for this study was restricted to the Southeast, it would be interesting to see a study that included teachers from other areas.

Microfilm \$2.50; Xerox \$4.80. 95 pages.

THE UPWARD EXTENSION OF SECONDARY EDUCATION IN HAWAII

(L. C. Card No. Mic 60-754)

Teruo Ihara, Ph.D.
The Ohio State University, 1959

Statement of Problem

This study is an attempt to determine the ideal role of the community college as one aspect of the total educational program, and to investigate the possibilities for the upward extension of secondary education in Hawaii. The study includes (1) an historical review of the community college movement; (2) a review of the history of higher education in Hawaii; (3) the development of criteria for the establishment of a state-wide system of community colleges; (4) the use of the criteria to evaluate population and fiscal facts peculiar to Hawaii; and (5) a survey of the opinions of high school seniors, high school principals, and presidents of parent-teacher units regarding community colleges.

Procedure

The literature concerning community colleges and higher education in Hawaii was first reviewed to develop bases for the construction of criteria for the establishment of community colleges in Hawaii. This was followed by an investigation of the potential of the Territory of Hawaii to support community colleges in terms of student potential and finances. For further documentation a questionnaire survey of the opinions and attitudes of high school seniors, high school principals, and presidents of parent-teacher association units in Hawaii concerning community colleges was conducted. The results of the questionnaire study were used as the basis for most of the recommendations arising from this study.

Conclusions

On the basis of the research it can be concluded that (1) the facilities of the technical schools of the Department of Public Instruction are adequate to meet present needs for this type of post-high school education; (2) Hawaii has adequate student potential to establish and maintain at least one community college in each of the three "Neighbor Island" counties, and possibly three or four community colleges in Honolulu county; (3) Hawaii has adequate financial resources to support an expanded program of

post-high school education; (4) Hawaiians in general, represented by high school seniors of one county, and high school principals and presidents of parent-teacher association units in Hawaii, believe that (a) education beyond the high school is very important in today's world, (b) state governments have a great responsibility to provide its youth with educational programs beyond the high school, and (c) post-high school needs of the youth of Hawaii can be met best by the development of community college centers which are extensions of the public secondary school; (5) presidents of parent-teacher association units and high school principals believe that (a) state-supported educational institutions are doing an effective job of meeting the educational needs of the youth of Hawaii, (b) most of Hawaii's high school graduates who are capable of doing college work are enrolled in college programs, (c) lack of finance and lack of interest are the two major obstacles that keep capable high school graduates from enrolling in post-high school programs, (d) the establishment of community college centers would not increase the percentage enrollment in college programs of college-age youth and adults not now enrolled in post-high school institutions, (e) a completely free system of community colleges is not the answer to meeting the post-high school needs of Hawaii's youth, and (f) the cost of education beyond the high school should be shared, with the most common division of responsibility being around 70 per cent state to 30 per cent student tuitions; (6) among a representative group of Hawaii's high school students (a) a very high percentage of the seniors who have plans to attend post-high school institutions on the mainland United States say that finance and distance are of little concern, (b) consideration of finance and proximity of post-high school institutions, however, play a very important part in the final decision of the great majority of the high school seniors to or not to enroll in post-high school institutions, and (c) 70 per cent of all high school graduates in the study would seek post-high school education if community colleges were established in their communities and were free.

Microfilm \$4.50; Xerox \$16.00. 351 pages.

TORT LIABILITY AFFECTING SHOP TEACHERS WITH PROVISIONS FOR AVOIDING ACCIDENTS AND LITIGATION

(L. C. Card No. Mic 59-6359)

Denis John Kigin, Ed.D.
University of Missouri, 1959

Supervisor: H. H. London

Purpose of Study: The purpose of this study was to ascertain to what extent shop teachers are held liable in court actions resulting from classroom accidents. It sought to point out what legal protection shop teachers have, with possible methods of avoiding accidents and litigation. An additional purpose was to make shop teachers aware of the need for a basic understanding of the law as it affects them in their everyday school activities.

Method of Research: Data utilized in this study were obtained from: information forms sent to State Supervisors

of Trade and Industrial Education and to Executive Secretaries of State Teachers Associations in the forty-eight states and the District of Columbia; law books and law reviews; books on school law; professional education journals; newspapers; state statutes; and the National Reporter System. All material was proofread by a practicing attorney at law.

Summary: School districts in common law states are immune to liability under the principles of common law immunity. Teachers are not protected by this immunity and can be held liable for classroom accidents if negligence can be proved.

Only injuries caused by the negligent or careless action of the teacher can result in liability, and the burden of proof is on the plaintiff. Negligence has been found to be the most common reason for which a shop teacher can be held liable.

Generally speaking, one is liable in a negligence suit only if it can be shown that the injuries to another follows without any intervening cause from the negligent careless or improper actions of the defendant.

The authority by which the teacher may exert control over the pupils is contained in the legal phrase "in loco parentis." This authority is derived from the whole body of organized society.

Legislation and insurance have been advanced as possible solutions to teacher liability. Abrogation of common law immunity and save harmless laws have been tried in some states. Group occupational insurance has been accepted in nineteen states as a means of protection.

It was found that the best protection a shop teacher has from liability lies in the use of extreme care in all cases in which it is possible for a pupil injury to occur. The use of guards on machines, proper instructions and proper supervision were also found to be important in reducing the possibility of teacher liability.

Conclusions: The school district is not subject to suit unless a statute specifically makes it liable. An individual teacher is liable to suit for his torts, but negligence must be proved.

The consequences that may result from an accident are the most important consideration legally. Legal consequences cannot develop until, and unless, an accident actually occurs.

The abrogation of common law immunity of school districts is not the solution to teacher liability. Save harmless legislation and group occupational insurance plans have proved successful in assuring teachers financial assistance in the event of litigation.

Persons in state supervisory positions apparently are not fully aware of the prevalent conditions in their respective states, and should become familiar with the liability laws and maintain a file of all shop accidents whether or not they have resulted in litigation.

A periodic refresher course or other indoctrination courses dealing with advanced tools and machines would be of value in assuring that the shop teacher clearly understands the equipment he is working with.

A shop teacher, who remains in the classroom while the class is in session, who properly instructs pupils in the use of tools and machines, who maintains a constant safety program, and who has the welfare of the pupils at heart, should have little fear of liability.

Microfilm \$3.10; Xerox \$10.80. 240 pages.

JOB PLACEMENT IN THE VOCATIONAL HIGH SCHOOLS: A SURVEY AND AN APPRAISAL OF JOB PLACEMENT SERVICES IN VOCATIONAL HIGH SCHOOLS OF LARGE CITIES.

(L. C. Card No. Mic 59-6223)

Julius Kleiner, Ed.D.
New York University, 1959

The purpose of this study was to survey and appraise the job placement practices of vocational high schools of large cities in the United States.

Two major questionnaires and a series of field visits were employed to secure the data. One inquiry was sent to school superintendents to determine the number of cities having placement services for vocational schools and to ascertain the types of placement organization in these cities. The other questionnaire was sent to vocational school placement offices to obtain data concerning placement practices. This questionnaire had been sent out previously as a pilot study, and the items selected for it had been rated by a committee of informed persons.

From the inquiry to the superintendents it was ascertained that all large cities having vocational schools had some sort of placement service for these schools. In twenty-three cities (69.7 per cent) placement was handled by the local school office, and of these, slightly more than half (13), also reported occasional referral to the state employment service. Only six cities (18.2 per cent) reported a centralized-decentralized system, where the greater part of the placement was handled by a central office. Four cities (12.1 per cent) reported joint cooperation with the SES, but a few of the vocational schools in these cities reported that they did their own placement.

From the questionnaire sent to the placement offices, it was ascertained that little or moderate use was indicated for such job-securing techniques as "direct visit," "telephone solicitation," "letters and direct mail," "surveys of industry," and "labor-management advisory committees." Certain job-securing techniques which are also part of the vocational training program had fairly extensive use: "cooperative work-experience programs," "inviting representatives of industry to school affairs," and "contacts of shop teachers."

The section of the questionnaire pertaining to placement procedures furnished the finding that 41.8 per cent of the offices had at least one full-time placement worker. Many schools fail to make a periodic follow-up of referrals, with only 23.2 per cent of the schools reporting more than one follow-up. For certain items there was a high percentage of placement offices reporting use. These were items generally pertaining to the use of files and clerical services related to follow-up.

Cooperation with the SES was generally slight. Only four schools (5.9 per cent) had an arrangement of joint operations. The bulk of the placement offices (75.3 per cent) had an informal relationship which involved occasional referrals. Thirteen offices (18.8 per cent) did not use the SES at all.

Three levels of achievement were set up to determine the status of placement offices. Forty-one offices (59.6 per cent) were able to attain any of the three levels. The lowest level consisted of a combination of six key items.

Certain implications resulted from the study. Any future survey of placement should treat vocational and non-vocational schools separately. Further, there is a

need for extension of placement activity by at least 40 per cent of the schools since this number could not attain any of the three levels.

In the area of job solicitation there is a need for expanded activity by the schools. Also, many counselors need training in public relations and promotional techniques.

The cooperative work-experience program shows itself to be a strong force in placement. In the field visits all schools having this program reported that large numbers of students remained with the cooperating firms, with estimates ranging from 40 to 80 per cent. This program merits serious consideration by schools with poor placement results.

There is a decided tendency for vocational schools to place their own graduates, even where the school system maintains a central placement service, or where the SES has a setup of close cooperation with the schools. However, this tendency is not a final argument for restricting placement to the local school.

Microfilm \$2.50; Xerox \$8.00. 174 pages.

AN EVALUATIVE STUDY OF CURRICULUM CHANGE IN OHIO SECONDARY SCHOOLS

(L. C. Card No. Mic 60-760)

Dale Leo Knapp, Ph.D.
The Ohio State University, 1959

In this study, curriculum change referred primarily to the extent that required or elective courses in each of the curriculum areas have been added or dropped from the educational program or, in the case of required courses, reorganized into various types of block-time classes. The general purpose of this study was to determine the nature and extent of curriculum change in Ohio secondary schools for the period extending from the 1954-55 school year to and including the 1958-59 school year.

In order to accomplish the purpose of the study, Inquiry Forms were mailed to approximately one-half of the high-school principals in Ohio. Returns received from 365 schools, representing 33 per cent of all secondary schools in Ohio, constituted the basic source of data. Criteria used to evaluate changes were developed through a study of the professional literature. Some of the general conclusions reached appear below.

1. There has been a definite shift in trends in the curriculum of Ohio secondary schools. The current movement is decidedly toward a more rigid and enlarged academic program with a lessening of interest in those areas which are non-academic in character.
2. The prevailing trend is to increase requirements for all students in English, mathematics, and science and to make additional courses in these same areas available on an elective basis. In addition, large numbers of elective courses in foreign language are being added, largely for the benefit of college-bound talented youth.
3. The secondary school curriculum in Ohio is organized largely around separate subjects. While the

number of block-time classes compares favorably with the average for the nation as a whole, separate subjects generally retain their identity within the block-time class, and such classes are ordinarily limited to the junior-high level.

4. The major reason for increasing course requirements in academic subjects and for making a greater number of these courses available on an elective basis stems from the school and community's desire to respond to apparent societal demands and to provide an educational program geared to the needs of the college preparatory and/or talented youth. The Ohio State Department of Education is particularly influential in curriculum change.
5. Democratic processes are being used by most Ohio school administrators in that the professional staffs are usually directly involved in decisions necessitated by curriculum change; however, these procedures do not ordinarily extend to the involvement of lay persons and students.
6. The relationship between curriculum change and the school philosophy is somewhat vague, and indications of carefully considered philosophical problems bearing on curriculum change are rare. For the most part, curriculum change in Ohio schools is not proceeding in accordance with the more fundamental principles of curriculum development. The involvement of staff members in curriculum change is a notable exception.
7. The use of a basic textbook is utilized to the greatest degree as the major instructional resource as the result of course additions.

Microfilm \$4.55; Xerox \$16.00. 354 pages.

HIGH SCHOOL CLASS RANK AND ACADEMIC PERFORMANCE IN COLLEGE

(L. C. Card No. Mic 58-5728)

George Albert Kramer, Ed.D.
Rutgers University, 1958

Introduction

The phenomenal increase in population in the United States, bringing with it vastly increased pressures on college enrollments, demands more effective methods of selection in college admissions. Past studies indicated that reported rank in class in secondary schools is the best single criterion for predicting academic performance in college. This study assumed that improved prediction would result if reported class rank were considered separately, school by school.

Problem

"High School Class Rank and Academic Performance of Freshmen in College" analyzes the effectiveness of reported rank in class as a criterion in the admission of graduates of New Jersey public secondary schools to Rutgers, the State University. It also analyzed the assumption that better predictive patterns are possible when rank in class is considered individually by school. Further

consideration was given to such factors as size of graduating class, per pupil expenditure, type of community, and the judgment of educators.

Procedures

The first step concerned itself with 2,202 students in the Colleges for Men of Rutgers, the State University who enrolled as freshmen entering directly from New Jersey public secondary schools in 1953, 1954, 1955, and 1956, and who completed the work of two semesters within the first year. The relationship between the reported high school ranks and cumulative averages in college was computed and expressed by a coefficient of correlation. This coefficient was found to be .393.

The second step tested the assumption that better predictive results would occur if reported high school ranks were considered not indiscriminantly as is the present practice but separately school by school. Certain statistical tests as suggested by Walker and Lev analyzed this position.

The third step tested certain assumptions that were made to account for factors among the schools which might be responsible for a difference in the relationship between rank and academic performance in college for the several secondary schools.

Summary of findings

The results of the study confirmed the fact that better predictive results could be secured if high school ranks were considered separately for each of the several schools.

The results also indicated that the relationship between reported ranks and academic performance in college differs among the schools and the difference cannot be attributed to a chance distribution.

In addition, there is evidence that such factors as the size of graduation class, per pupil expenditure, and type of community have some effect upon the relationship between reported rank and academic performance in college. The subjective judgment of educators, it was also discovered, could be used to identify schools according to the performance of their graduates at Rutgers.

Conclusions

Reported rank in class as a criterion for admission to college should be considered individually by school.

Graduates from secondary schools seem to perform better academically in college when the secondary school from which the student graduated (a) has a large graduating class, (b) has a high per pupil expenditure rate, and (c) serves a residential or high income community.

To improve the admissions procedures at the Colleges for Men, single regression lines showing the effect of reported class rank on academic performance in college could profitably be drawn for each secondary school included in this study.

Implementation of the results of "High School Class Rank and Academic Performance of Freshmen in College" is recommended not only to Rutgers, the State University but to similar institutions as well.

Microfilm \$2.50; Xerox \$7.80. 166 pages.

THE COMMUNITY SERVICES OF SELECTED PUBLIC JUNIOR COLLEGES

(L. C. Card No. Mic 59-6361)

Roland Louis Lanser, Ed.D.
University of Missouri, 1959

Supervisor: Ralph K. Watkins

Purpose: The purpose of this investigation was to describe the community service programs of Joplin Junior College, Joplin Missouri; Hutchinson Junior College, Hutchinson, Kansas; and Northeastern Oklahoma A. and M. College, Miami, Oklahoma.

Method of Research: Data for the study were obtained from college and community records, faculty questionnaires, faculty community service diaries, and interviews. A total of 393 interviews were conducted with college staff personnel, college administrators, and individuals of the communities.

Summary:

- (1) Community service is defined as the controlled utilization of the college physical resources and personnel for the purpose of providing for the educational, cultural, and economic needs of the community and its citizens.
- (2) Although community services were fairly extensive at the three colleges, it appeared that there was little planning of the community service function. Only one written community service policy was found in the three colleges studied. Under a permissive attitude on the part of the college administration, those community services that did not cost the college an appreciable extra amount of money were encouraged.
- (3) The planned community service that was apparently best meeting a community need was the adult education program. However, the colleges followed no consistent pattern of organization of adult education. The adult education programs were flexible as the colleges attempted to meet the changing demands of the adult education students.
- (4) The community service the people of the junior college community were most aware of was that of adult education. Athletic events, music and dramatic programs, use of the college as a meeting place, and faculty members' participation in community activities were other community services given prominent recognition by the citizens of the communities. The citizens of the junior college community recognized that the community services of the colleges and faculty members promoted community improvements in the areas of education, economics, and fine arts.
- (5) There was little evidence that the controlling boards of the colleges had much direct participation in the establishment of community service policies. The college dean and president, in cooperation with other administrative personnel, apparently established most community service policies. However, faculty members had an opportunity to participate in community service planning through committees and faculty meetings.

- (6) There are some community services that are related to assigned institutional duties. Usually the adult education courses taught by the faculty members paralleled the courses taught in the day program. There was also some evidence that music and speech teachers were expected to participate in community services associated with music or dramatics because they were part of the assigned instructional duties. Because much faculty participation in the community service function was mainly on a voluntary basis, the determination of the type of community service rendered by the faculty member was by personal choice rather than associated with the assigned institutional duty.

Conclusions:

- (1) The extent and type of community service function have little relationship to the source of financial support or the type of administrative organization among the three selected colleges.
- (2) In general, there is little difference in the major community services provided by Midwest public junior colleges.
- (3) The citizens and faculty members of the communities in which junior colleges are located favor the community services rendered by the junior colleges.
- (4) Most of the community services offered by the Midwest public junior colleges are activities primarily associated with the day time program rather than planned to meet specific community needs.
- (5) Junior colleges exercise little direct control over individual community services.

Microfilm \$3.60; Xerox \$12.60. 279 pages.

MATERIALS, METHODS, AND TECHNIQUES USED IN TEACHING GENERAL BUSINESS.

(L. C. Card No. Mic 60-676)

James Walter Loyd, Ed.D.
University of Kentucky, 1955

This study sought to determine the materials, methods, and techniques of teaching used by selected teachers of general business in Indiana, Ohio, Kentucky, and Tennessee. The sixty teachers interviewed were recommended as outstanding teachers of general business by leading business educators familiar with their teaching procedures. The study proceeded on the assumption that knowledge of the successful experiences of these teachers would be of value to other general business teachers.

The study disclosed that general business is one of the favorite subjects of most of the teachers interviewed. Its popularity seems to result largely from three factors: (1) realization by the teachers of the practical value of the subject matter, (2) recognition of the worth of the course by students, parents, and other interested laymen, and (3) enrichment of preparation through methods courses in the teaching of general business and through actual experience in business. A large majority of those interviewed recommended that work experience in business

and a special methods course in the teaching of general business should be requirements in the education of all prospective teachers of general business.

A principle generally recognized in the field of education is that the materials used in teaching affect the quality of learning. A large majority of the superior teachers interviewed use, in addition to the adopted classroom textbook, supplementary materials that pertain to the subject matter, indicating the value of such materials.

Because many of the teachers interviewed considered the business forms in the textbooks and the vocabulary exercises the most valuable factors of general business workbooks, the publishers of the workbooks should probably devote more attention to these two factors than to others.

Because discussion of teaching methods and lists of available films and film-strips in the teachers' manuals which accompany general business textbooks are the factors which are of great value to the largest number of the teachers interviewed, the authors of these manuals should devote more attention to these two items than to any others.

Because the study shows that superior teachers use a variety of methods in presenting general business to their classes, it seems that all general business teachers would do well to consider carefully various methods and choose from them the ones which they deem most applicable to the situations in which they find themselves. The unit and group discussion methods were reported used frequently by all teachers interviewed, although a variety of other methods were reported used.

As shown by the fact that twenty-one different techniques of teaching are used by more than one-half of the teachers interviewed and five of the twenty-one techniques are used "often" by more than one-half of the teachers, it seems safe to conclude that other teachers of general business should analyze their teaching procedures with a view to determining ways that they might enrich the learning experiences of their students through the use of many and varied techniques. The five techniques of teaching which are used often by the largest number of teachers interviewed are: blackboard, specimens and models, teacher demonstrations, sound films, and cartoons and pictures.

It is the opinion of the writer that, as this study included only outstanding teachers of general business, whose experience in teaching the subject have attracted favorable attention of leading business educators, a study similar to this, but including teachers of less note, is needed. Such a study would make possible a comparison of materials, methods, and techniques used by outstanding teachers of general business with those used by less well-known teachers.

Microfilm \$2.50; Xerox \$5.40. 106 pages.

**A COMPARISON OF SELECTED BACKGROUND
VARIABLES AND GRADUATE ACHIEVEMENT
IN EDUCATION AS MEASURED BY
A GRADUATE EDUCATION BATTERY**

(L. C. Card No. Mic 60-677)

Howard Burbeck Lyman, Ph.D.
University of Kentucky, 1951

In an attempt to discover whether certain factors were related to graduate achievement in education, a Graduate Education Battery was developed, validated as far as possible, and compared with selected background variables. The battery was constructed in an attempt to provide objective graduate-level tests related to major instructional areas within the field of education.

Seven hundred and ninety items were constructed and placed in thirteen preliminary tests which were given to graduate-student groups of varying size in the College of Education at the University of Kentucky during the 1950 Summer Session. The items were analyzed, with Flanagan's "r" whenever feasible, and the most discriminating items were selected for use in the seven-test, 405-item battery, which thirty volunteer students took.

Because of the small number of students involved, the validity of the battery might be seriously questioned if the validation had been based on any single study; however, examination of the data from all of the studies leaves little doubt that the battery may be considered a valid measure of graduate achievement in education.

Relationships between Graduate Achievement
in Education and Selected Background Variables

The nature of the group tested was such that a number of contemplated studies could not be made; however, it was possible to use the following twelve variables: intelligence, age, size of high school, mid-parent education, sex, teaching experience, marital status, type of college attended as an undergraduate, ultimate educational objective, supervisory or administrative experience, state of birth, possession of standard teaching certificate.

Contribution of This Research

It was the intent of this research to study twelve factors which might be related to graduate achievement in education. The limitations imposed on the research by the small number of participating students made broad generalizations impossible, but this research definitely points the way to further study. It seems evident that those factors pertaining to professional experience and to age are related to graduate success, whereas it seems questionable whether certain other background factors are related. It is conceivable that even professional experience and age would not be related to graduate achievement if the amount of training were held constant; however, the size of the participating group was so small that partial correlations would have been meaningless in the present research. The chief theoretical contributions of this research have been to indicate several factors which are related to graduate achievement in education and to suggest a fruitful area for further research.

The practical contribution of the Graduate Education Battery may prove of even greater importance. At pres-

ent, there are two nationally-available, graduate-level tests of achievement in education; however, both treat knowledge of education as a single factor, and neither offers much validation data. The Graduate Education Battery, on the other hand, is composed of tests which relate to several areas within the field of education. In addition, at least some indication has been given as to the validity of the instrument. Hence, for some purposes, the Graduate Education Battery should prove more satisfactory than similar instruments now available.

Microfilm \$2.50; Xerox \$4.40. 83 pages.

**AN INVESTIGATION OF THE DEVELOPMENT
OF THE BOSTON UNIVERSITY HOSPITAL
AND TUTORIAL PROGRAM 1948-1958.**

[Volume I only. Volume II not microfilmed
at the request of Boston University
School of Education.]

(L. C. Card No. Mic 60-483)

Francis Albert McElaney, Ed.D.
Boston University School of Education, 1959

Purpose: The purpose of this study was to investigate the development of the Boston University Hospital and Tutorial Program from its inauguration in April 1948 through June 1958. Implicit in this examination of the development of a special program for the severely handicapped student was an examination of course content, methods of providing instruction, administration, cost and justification for providing such a program. Also, following the premise that the success or failure of the students would indicate the success or failure of the program, the writer studied the fifty-four students who had been enrolled in the program during the ten year period. Implicit in this study of the students was an examination of the criteria for acceptance, the achievement of the enrollees, the family background, the educational status, or occupation or profession in which the student is currently engaged.

Procedure: The first purpose of the study was accomplished through an extensive examination of all University records, correspondence, or literature during the ten year period. The second purpose of the study was accomplished through a comprehensive case study of each student and a follow-up of each student until June 1958. The case study included materials gathered from test data, medical reports, psychological reports, social service agencies' reports, interviews with student, family, physician, counselors and University staff and faculty with whom the candidate worked.

Conclusions: The Hospital and Tutorial Program sponsored and administered by Boston University has been successful for thirty-two of the total fifty-four students who have been enrolled. Twenty-seven students received their Associate of Arts degree with five students currently completing their sophomore year in the program. Sixteen students received their Bachelor's degree and nine students are currently completing the requirements for the Bachelor's degree. Of the sixteen students who received their Bachelor's degree, six continued through

their Master's program and of these six, three students are in the process of completing the requirements for their Doctorate degree.

Twenty four students are engaged in working in full-time positions and two students are engaged on part-time fellowships in two Universities.

One further conclusion is that no single criterion may be used to predict academic success for the severely handicapped students and that motivation and willingness to exert maximum effort is the prime factor for successful achievement and rehabilitation.

Microfilm \$2.50; Xerox \$4.80. 94 pages.

COMPARISON OF MEMBERS AND NON-MEMBERS OF GREEK LETTER SOCIAL FRATERNITIES AND SORORITIES AT VIRGINIA STATE COLLEGE

(L. C. Card No. Mic 59-6583)

James Conway Nelson, Ed.D.
Indiana University, 1959

Chairman: H. Robert Kinker

Statement of Problem

The purpose of this study was to ascertain whether students who were members of social fraternal organizations at Virginia State College were significantly different in certain selected characteristics from non-fraternal members.

Methods and Procedure

The subjects selected for this study were undergraduate students enrolled at Virginia State College from September, 1954 through May, 1958. Snedecor's Table of Random Numbers was used in the selection of fifty-five fraternity members and fifty-five sorority members who comprised the fraternal group. To acquire the subjects for the non-fraternal group, the same procedure was followed and fifty-five males and fifty-five females were selected.

The psychological test data were taken from the records of the freshman testing program on file in the offices of the College Counseling Service and the Educational Testing Bureau. The test results originally were procured through use of The Otis Quick Scoring Test of Mental Ability, Gamma Form, The Iowa High School Content Examination, Form L, The Bell Adjustment Inventory, Student Form and The Nelson-Denny Reading Test. The academic grades for each student and the number of semester hours completed were secured from the office of the College Registrar.

Information regarding the health status of students was provided by the College hospital. The data concerning the parents' occupations, the total number of siblings, and the number of extracurricular activities in which the subjects participated were collected from the cumulative records in the Personnel Deans' Offices. The statistical treatment of the data involved the chi-square test of independence, the coefficient of contingency, the analysis of variance, and the t-test of the difference between means.

Findings

The findings included the following:

1. The F ratio of 37.09 for the between-group fraternal classification of intelligence quotients was significant at the one per cent level.

2. The analysis of variance data of achievement in reading revealed an F ratio of 46.90 for fraternal classification which was significant at the one per cent level.

3. The F ratio of 50.70 for the between-group fraternal classification, with reference to achievement in English, greatly exceeded the criterion of significance at the one per cent level.

4. The variance estimate of 38.48 for the between-group fraternal classification denoted a definite difference in the achievement of members and non-members of Greek letter social organizations in regard to mathematics.

5. The chi-square value of 53.40 and the related F value of 0.442 for fraternal affiliation and rank in high school graduating class was found to be statistically significant at the five per cent level.

6. The variance estimate of 34.31 for semester hours of work completed was found to be significant at the one per cent level in favor of students having membership in Greek letter social organizations.

7. The between-group fraternal classification F ratio, 137.52, for data relating to general scholastic averages was significant at the one per cent level.

8. The estimated variance or F of 166.12 for the between-group fraternal classification derived from the analysis of data of participation in number of extracurricular activities greatly exceeded the criterion of significance, 6.76, at the one per cent level.

Conclusions

In view of the results obtained through pursuits of the present investigation, certain of the more important conclusions drawn from this study were selected for reporting.

1. The fraternal groups were quite successful in achieving their objective to encourage their members to participate in extracurricular activities.

2. Comparable success was experienced by the fraternal groups in their efforts to promote good scholarship among their membership.

3. The scholastic averages of students did not suffer after joining a Greek letter social organization insofar as reference is to fraternal members as groups.

4. Greek letter social organizations attracted the academically stronger students.

Recommendations

Included in the recommendations were:

1. That there should be full recognition of the worth of Greek letter social organizations on the campus.

2. That interested and qualified students should be encouraged to join fraternities and sororities.

3. That Virginia State College should continue its traditional policy of housing fraternal organizations.

Microfilm \$2.50; Xerox \$5.80. 120 pages.

CONCEPTIONS OF AMERICAN IDEALS IN A PROGRAM OF EDUCATION

(L. C. Card No. Mic 58-7234)

Virginia Louise Radley, Ph.D.
Syracuse University, 1958

This study brings together the thoughts and opinions of six American, contemporary, intellectual historians on four American ideals which they are found to have emphasized in their writings. The historians studied are: Merle Curti, Henry Steele Commager, Ralph Gabriel, Vernon Louis Parrington, Carl Lotus Becker, and the Beards. The ideals treated in this study are: Law, Individuality, Freedom, and Equality.

The purpose of this study is to provide the reader with fairly authoritative statements about, or opinions concerning, a few of the ideals which have been, or are now, inherent in our culture for the final purpose of determining what implications these ideals, if realized, would have for a program in education.

The initial groundwork for the study was laid through extensive bibliographic research. The methods used are those of survey and analysis eventuating in an historical and philosophical interpretation of the four ideals.

The conclusions extend to the implications which the realization of these ideals would have for a program in education. Most of these implications are for the philosophy of education, an area foundational to methodology, curriculum planning, and administrative policy. The implications of the findings in regard to Law suggest that the philosophy of education should be one firmly grounded in the basic philosophy of idealism rather than one saturated with today's popular philosophy of pragmatism. The implications for education of the ideal, Individuality, again extend into the area of the philosophy of education and suggest that a successful program in education would do well to re-examine the idea of the "child-centered school" and substitute in lieu of this the idea, so eloquently expressed in Renaissance education, of the "whole man." This latter is in accord with the ideal, Individuality, and with its concomitant, the "social principle." The findings in regard to Freedom have implications for education which extend to a reinterpretation of the meaning of Freedom to include those postulates integral with the ideal, i. e., that Freedom cannot exist without some framework of intelligent authority and that Freedom carries with it responsibility. The implications which this examination of the ideal of Equality has for education lie in the knowledge that Equality as an ideal is neither today apparent nor understood. Thus it is the task of education to reinterpret Equality in regard to its meanings and to its purport if Americans are to come to a realization of this ideal.

Finally, it is concluded that educators would do well to concentrate upon the formulation of an international, rather than a national, philosophy of education for the reason that the best of American thought and ideals is similarly the best of world thought and ideals.

Microfilm \$2.50; Xerox \$7.60. 163 pages.

A STUDY OF THE PROBLEMS FACED BY FOREIGN STUDENTS AT INDIANA UNIVERSITY WITH IMPLICATIONS FOR ACTION

(L. C. Card No. Mic 59-6587)

Antusa Perez Santos, Ed.D.
Indiana University, 1959

Chairman: Louis G. Schmidt

The Problem

The purpose of this study was to determine the problems of seven groups of foreign students enrolled at Indiana University during the second semester of the school year 1958-1959 with a view of planning adequately for realistic services to meet their inventoried needs.

Procedures

To obtain the data for the study, the following instruments were devised: the Foreign Student Problems Check List, the Foreign Student Advisers' Check List, and the Personal Data Questionnaire. Additional information was obtained through the use of the personal interview. The academic, financial, personal, religious, emotional, and social aspects of adjustment to college life were analyzed. The opinions of a selected group of experts in the field were solicited in an effort to establish valid grounds for proposing a realistic program of personnel services.

The sample was limited to the non-English speaking countries in seven geographical areas, namely: Latin America, Europe, Southeast Asia, Southwest Asia, Southern Asia, Central Africa, and North Africa. There were 198 students, or 50 per cent drawn from a total of 390. Returns were received from 160 students, or 81 per cent of the sample.

The selection of the experts in the field was based on the size of the foreign student enrollments in the institutions they represented. The foreign student advisers in fifteen institutions of higher education in the United States with over 400 foreign students were chosen as the experts. Returns were received from 13 foreign student advisers, or 86 per cent of the group.

The analysis of variance, the F-tests, and the selected t-tests were used in the statistical treatment of the data.

Findings

The principal findings were: (1) The seven groups varied in age range, ability to speak English before coming to the United States, amount of travel experience, religious preferences, length of residence in the United States, preferences regarding housing, and participation in campus activities. (2) Only a small percentage of the members of the seven groups, with the exception of the Southeast Asian group, participated in organized orientation programs. (3) A majority of the members of the seven groups had enjoyed the hospitality of American families, and had availed themselves of the university personnel services. (4) The academic, financial, and social problems gave the most trouble, while the religious and personal problems gave the least trouble to the total group of foreign students. (5) The non-Christian students, the non-English speaking students, and the undergraduate

students scored higher than did their counterparts in two or more problem areas. (6) The differences among the various groups with regard to two or more of the problem areas were significant at the .01 or .05 level of confidence. (7) A majority of the group of experts indicated the availability of most of the personnel services listed in the Foreign Student Advisers' Check List.

Conclusions

On the basis of the findings the following conclusions are given: (1) The academic, financial, and social problems seemed to give the most trouble to the foreign students, and the religious and personal problems seemed to give the least trouble. (2) The seven groups varied widely with regard to general characteristics and to the six problem areas. (3) The Christian students, travelled students, and graduate students seemed to be better adjusted than their counterparts. This indicated that the religious preference, travel experience, and class standing seemed to be factors in the total adjustment of the students. (4) The ability to speak English before coming to the United States failed to be a factor in the total adjustment of the students, although it seemed to be a factor in academic adjustment. (5) The personnel services at Indiana University seemed to approximate those available in the other selected universities. Only a few of the selected schools required the new students to attend orientation courses, and gave entrance examinations. (6) There seemed to be a need for the establishment of the following personnel services to help foreign students in their adjustment to American university life: a) expanded staff to advise students, b) more detailed orientation program, c) better facilities for the teaching of English, d) more integration between the adviser and the foreign students, and e) International Center.

Microfilm \$2.70; Xerox \$9.25. 205 pages.

PERSONAL STYLES OF HANDWRITING IN GRADES SIX, SEVEN, EIGHT, AND NINE.

(L. C. Card No. Mic 59-6594)

Eloise Patricia Seifert, Ed.D.
Boston University School of Education, 1959

The major purpose of the study was to analyze and classify styles of personal handwriting among children in grades six, seven, eight, and nine. The investigation also sought to discover: (1) the frequency of such handwriting among children who have been taught basal systems, (2) the grade levels where personal styles start, (3) the quality of such handwriting, (4) the attitudes of pupils in regard to personal styles, (5) the rate of speed used when writing personal styles, and (6) the relationship between personal styles of handwriting and intelligence, personality characteristics, and motor coordination.

Procedure

Five separate handwriting samples were obtained from one thousand and twenty pupils in grades six, seven, eight, and nine. The purpose of each sample was as follows:

Sample #1--to obtain a sample of the pupil's personal style (untimed); Sample #2--to obtain a sample of the pupil's personal style (timed); Sample #3--to obtain a sample of the pupil's writing when using the standard system (untimed); Sample #4--to obtain a sample of the pupil's writing when using the standard system (timed; and Sample #5--to obtain a random sample of the pupil's daily work.

Sample #1 was analyzed in the light of certain criteria in order to establish whether the writing was: (1) a personal style, (2) a standard system, or (3) deteriorated handwriting.

The major study was concerned with the four hundred and fifty-eight pupils who showed evidence on this sample of having a personal style.

Intelligence quotients scores were recorded for each pupil in the study. At the ninth grade level, test scores for motor coordination and personality were determined to establish the relationship between personal styles and these two factors.

A general inquiry form was submitted by each pupil in the study in order to determine attitudes toward personal styles and frequency of use.

In analyzing the data, scores were obtained in order to evaluate: (1) letter formation, (2) handwriting characteristics such as size, slant, spacing, and alignment, (3) speed of writing using personal style and standard style, (4) quality deterioration under pressure, and (5) quality of daily work samples.

Means and standard deviations were determined by grade in regard to the above variables.

Status studies were made at the ninth grade level by dividing the population into quartiles on the basis of motor coordination and personality and determining the difference in the percentage of personal styles within the quartiles.

Major Findings

- A. At least one third of the population at each grade level showed evidence of using a personal style of handwriting.
- B. Many pupils (32.09 per cent) stated on the questionnaire that they were unable to remember the grade level where they began using a personal style. Of those remembering, the greatest number of pupils in grades six, seven, and eight selected the previous grade level as the one where they began using a personal style. The greatest number of grade nine pupils indicated that grade seven was the level where they began using personal styles.
- C. In regard to the quality of personal styles, each grade level obtained a mean percentage score of at least 80 per cent, indicating that the quality of the writing was generally good.
- D. More than half the population having personal styles stated on the questionnaire that they found this handwriting to be quicker and easier to use and this type of writing was used by them in all writing in and out of school. At least one third of the pupils at each grade level felt personal styles look better than other types of writing.

- E. The mean speed scores for each of the grades vary from 60 letters per minute in grade six to 88 letters per minute in grade nine.
- F. In regard to the two characteristics of motor coordination and personality, no positive relationship existed between these two factors and personal styles of handwriting. In grades six, seven, and eight no positive relationship existed between intelligence and personal styles. In the fourth quarter of the grade nine population, however, there was a significant relationship between these two factors, as indicated by a critical ratio of 2.79. Microfilm \$2.50; Xerox \$5.80. 117 pages.

AN EXPERIMENTAL STUDY OF TRANSFER
OF CONCEPTS DEVELOPED IN A
COLLEGE SOCIAL SCIENCE COURSE
TO THE CAMPUS CULTURE

(L. C. Card No. Mic 60-552)

Ludwig John Spolyar, Ph.D.
Michigan State University, 1959

Major Professor: Walter F. Johnson

In 1944, Michigan State University established a general education curriculum which was required of all students in the University. One of the four present general education courses is the Basic Social Science course whose aim is to educate the student to understand his society and the individual's relationship to it.

The purpose of this research was to study the effectiveness of the Basic Social Science course on the Transfer of certain social science concepts taught in the course to the immediate campus culture and society in which the student is presently living. This was done by comparing one hundred fifty (150) freshmen and sophomores (the Experimental Group) who were completing one year of Basic Social Science to sixty (60) freshman (the Control Group) who had never enrolled in any of the Basic Social Science courses. All students used in this study were single, non-veterans, lower classmen, between the ages of 17-20 years, and had lived in a residence hall for at least one year. Using the Fisher t-Test, no significant difference was found between the two Groups on scholastic aptitude, reading comprehension, and participation in extracurricular activities in college.

Additional study was conducted within the Experimental Group on variables that may influence the knowledge and understanding of social science concepts in the academic, applied, and transfer of training situations.

Both Groups were administered a thirty-six (36) item academic Social Science Test and a thirty-six (36) item applied Campus Culture Test. Both Tests contained the same thirty-six (36) social science concepts. Using the Fisher t-Test, the Experimental Group was compared to the Control Group on (1) the Social Science Test, (2) the Campus Culture Test, and (3) the number of concepts known and understood on the Social Science Test and the Campus Culture Test. (This was termed Transfer Score.) Also, the Fisher t-test was used to determine, for each Group, the difference between their actual achieved Transfer Score and the Transfer Score which could be obtained by chance, depending on their Social Science score and Campus Culture score.

The Pearson r formula was used to determine the relationships between scholastic aptitude and reading comprehension with knowledge, understanding, and transfer of social science concepts.

Results of the study showed that students who experienced the Basic Social Science course knew and understood social science concepts better than students who had not experienced the course on (1) the academic social science test, (2) the applied social science test, and (3) the number of social science concepts that were common to both tests. The Basic Social Science student also had greater ability in transferring the social science knowledge and understanding from an academic setting to an applied situation.

It was concluded that students who experienced the Basic Social Science course developed greater knowledge, understanding, and ability to transfer their training in the social science area.

Within the group of students who experienced the Basic Social Science course, no conclusive data was found on the influence of scholastic aptitude, reading comprehension, participation in college extracurricular activities, and academic majors on social science knowledge, understanding and transfer of training.

Microfilm \$2.50; Xerox \$5.60. 115 pages.

CONANT'S RECOMMENDATIONS FOR THE
AMERICAN HIGH SCHOOL: IMPLICATIONS FOR
IMPLEMENTATION IN OHIO HIGH SCHOOLS.

(L. C. Card No. Mic 60-798)

Donald R. Steer, Ph.D.
The Ohio State University, 1959

The initial impact of the Conant report and recommendations found in his recently published The American High School Today has been great in the field of secondary education. This study attempts to arrive at some implications of these recommendations for Ohio high schools.

Conant's 21 recommendations were revised to form thirty recommendations, each of which is more concise and less encompassing than Conant's. A questionnaire of quick-check answers was developed to secure (1) information from principals concerning practices in their high schools relevant to the Conant recommendations and (2) opinions of the principals regarding desirability, feasibility, prospects for implementation, factors considered important in the recommendations' acceptance and implementation or rejection or retardation, and the anticipated roles of certain groups on action taken on individual recommendations and on the whole group of recommendations.

Letters inviting participation in the study were sent to principals of the 1,107 Ohio high schools that offer diplomas. Questionnaires were sent to the 607 who responded affirmatively. The 506 questionnaires returned were representative of Ohio schools with respect to size of the school and its district organization, with the exception of a low return from private and parochial schools.

Recent literature contains numerous periodical articles about the Conant report and recommendations. Some were written by Conant in an effort to publicize his conclusions more widely; others were written by persons whose purpose

was to evaluate Conant's conclusions. Several sets of previously stated objectives and standards were found to have relevance to Conant's current proposals.

Responses on desirability and feasibility of the entire group of recommendations were analyzed by the responding school's size, district organization, geographic-political location, regional accreditation, and several criteria relating to financial status and to teaching loads.

Reactions to the recommendations were reported by the principals for such groups as faculties, boards of education, and community groups. Comments of the principals on the report and entire group of recommendations, as well as on individual recommendations, were reported.

The principals were found to consider the recommendations with great approval, both when considering them as a group and when considering them individually. A large majority of them also considered the recommendations quite possible to implement, although for many it might take up to five years to do so. The factor considered most important in the recommendations' acceptance and implementation is the current interest in secondary education. The three factors considered of almost equal importance in the recommendations' rejection or retardation are a small enrollment, lack of physical facilities, and too few available teachers. Faculties are expected to influence action on the recommendations in a very positive direction, pupils' influence is expected to be somewhat positive, and the influence of boards of education and community groups is expected to be intermediate to these two groups.

Some recommendations seem much more acceptable than others. Those most highly approved by the principals emphasize the need for a comprehensive high school; a maximum counselor load of 250-300 pupils; art and music electives for all; a developmental reading program; half of English time in composition including one theme per week; maximum pupil load of one hundred per English teacher; and appropriate vocational programs. The recommendations ranking lowest in approval are those asking for four years of one foreign language for academically talented pupils, seven years of mathematics and science for academically talented girls, and no ranking of graduating seniors on basis of grades in all courses. These same three recommendations, along with those which recommend separate physics and chemistry courses according to mathematical background and separate programs for the slow readers, constitute the group of recommendations least likely to be implemented.

Microfilm \$3.80; Xerox \$13.50. 296 pages.

AN ANALYSIS OF THE GUIDANCE ORGANIZATION AND SERVICES IN SELECTED SENIOR HIGH SCHOOLS IN THE STATE OF INDIANA

(L. C. Card No. Mic 59-6588)

Carl J. Stewart, Ed.D.
Indiana University, 1959

Chairman: Howard T. Batchelder

The purpose of this study was to analyze the existing guidance organizations and services in the selected commissioned senior high schools of Indiana. These findings were then compared and contrasted with recommended authoritative guidance standards for secondary schools.

The data were collected by means of personal visits to 10 senior high schools, or a 50 per cent random sampling of all senior high schools in Indiana. At the schools, interviews were conducted with the directors of guidance, representative faculty members, and selected students. All interviews were guided by previously prepared and validated interview guides. A student questionnaire was also administered to approximately 10,000 students, after which a 10 per cent random sample was selected by grade levels to be used in the statistical analysis.

During the personal visits at each school other data were collected, such as daily schedule of classes, handbooks, and other duplicated materials pertinent to the study of the guidance organization and services.

The following conclusions were drawn from the data: (1) The degree to which guidance personnel were organized and utilized administratively vary greatly within the 10 school systems. (2) Additional guidance personnel or additional time for the present guidance personnel are needed in most of the senior high schools included. (3) Additional guidance specialists are needed in order to have adequate personnel to whom referrals may be made. (4) The guidance programs of the 10 senior high schools are being administered for the most part through recommended approaches. (5) Wide variation in practices exists among the schools using the homeroom as an approach through which guidance is administered. (6) The in-service training program in guidance for faculty members is inadequate in most of the schools. (7) The provisions for individual counseling services are being emphasized in all schools and some aspects of these services are approaching adequacy. (8) Students are generally aware of the existing guidance services and are seeking help and information concerning various guidance activities from the guidance personnel in the schools. (9) Group guidance activities are considered of major importance as an approach through which guidance may be administered, with certain of these activities approaching more satisfactory levels of utilization than others. (10) Student information collected and recorded as a part of the guidance programs is reasonably adequate for certain basic items, and less adequate for others. (11) Provisions for placement services are generally inadequate in the selected senior high schools. (12) Provisions for follow-up and appraisal studies are generally inadequate in these schools. (13) As judged by the directors of guidance, the materials and agencies of most use in the guidance programs of these high schools are: standardized tests and rating scales, the school newspaper, the guidance library for students, extracurricular organizations, student government, audio-visual aids, the school guide book, and the use of community agencies and resources. (14) Of the major problems confronting the progress of the guidance programs in these high schools, lack of enough time for guidance personnel, lack of trained counselors, and lack of full appreciation of the guidance program by many teachers are considered of greatest significance by the directors of guidance. (15) The directors of guidance are in general agreement with the 20 basic principles underlying the organization of the guidance services. (16) The relative degree of attainment of certain basic principles underlying the organization of guidance services in the selected senior high schools, as judged by the directors of guidance is in general agreement with the findings of the present study.

Microfilm \$4.25; Xerox \$15.10. 332 pages.

A STUDY OF RECOMMENDED GUIDANCE REPORT INFORMATION FOR STATE DEPARTMENTS OF EDUCATION

(L. C. Card No. Mic 59-6589)

Kenneth Wilbert Waugh, Ed.D.
Indiana University, 1959

Chairman: W. M. Barr

The Problem

In recent years the role of state departments of education has expanded from one primarily of regulation to include such functions as professional leadership and planning, research, and specialized and generalized educational services. This research was designed to study the guidance report information deemed important to state departments of education in the performance of their expanded role in education. A second purpose was to determine the relative importance of various guidance report information.

Procedures

A checklist was used to obtain the necessary data. The checklist was formulated from guidance report items found on various report forms in state departments of education; questionnaires used in local, state, regional, and national studies of guidance programs, and suggestions from guidance authorities. A tentative checklist was submitted to a pilot group of state department of education personnel to check the mechanics of answering the checklist.

The final form of the checklist, containing 247 items, was sent to 40 state supervisors of guidance, 48 state supervisors of secondary education, and 48 counselor-trainers. These individuals rated each item on a five point scale ranging from information of no value to information considered essential to state departments of education.

One hundred four completed checklists were used in the findings. These items were statistically weighted to obtain a T weight for each item on the checklist. The T weights were used to determine the relative value of each of the items in the checklist to state departments of education.

Findings

The following types of information had value to state departments of education: (1) Items to help identify schools such as enrollment, organization, and curriculums offered, (2) specialists and faculty personnel in the local guidance program, including time involved and the duties performed, (3) a school's anticipated need for guidance personnel, (4) general information regarding occupational information services, (5) a school's provision for work-experience and local employment information, (6) educational information available to students, (7) tests given in a school, grades in which given, and uses made of the tests, (8) cumulative record information, including data recorded and use made of materials, (9) the counseling program, (10) follow-up information of students, (11) special services available to the guidance program, (12) a school's promotion program for guidance services, (13) provision for guidance inservice education, (14) help and services desired from the central agency, and (15) a school's evaluation of the total guidance program.

Conclusions

From the analysis of the data and findings the following conclusions were drawn:

1. The respondents indicated a need for more guidance information in the office of the state departments of education.
2. The respondents indicated a need for the present guidance report forms to be re-evaluated.
3. Report items reflected information that could facilitate the supervision and research functions of state departments of education.
4. It was possible for state departments of education to obtain comparable data for regional and nation-wide research.
5. General items in a special area should have a higher priority than more specific detailed items of information in that same area on state guidance report forms.
6. The basic guidance report information for state departments of education included 104 items of information. Microfilm \$3.95; Xerox \$13.95. 307 pages.

A STUDY OF MECHANICAL JOBS PERFORMED BY SELECTED FARMERS IN MISSOURI

(L. C. Card No. Mic 59-6368)

Curtis Ross Weston, Ed.D.
University of Missouri, 1959

Supervisor: Dr. G. F. Ekstrom

PURPOSE: The major purpose of this study was to determine what mechanical jobs are performed by selected Missouri farmers. In addition the farmers opinions were requested as to whether they should perform the designated jobs, and also, the jobs in which they desired additional training. These three groups of data were compared for the eleven economic areas in Missouri, and by the tenure status of farmers.

METHOD OF RESEARCH: The data for this study were procured through an information form sent to 273 teachers of vocational agriculture in Missouri. The teachers selected two successful farmers in their communities to complete the information form. The form was judged by a jury of agricultural engineering faculty members for validity of the farm mechanics jobs included. Forms were returned by 423, or 77.5 per cent, of the farmers who were requested to supply the data.

SUMMARY: Of the 90 farm mechanics jobs designated, 59 were performed by over 50 per cent of the farmers.

Over 50 per cent of the farmers believed they should perform 86 of the designated jobs.

Over 30 per cent of the farmers desired additional training in 40 of the 90 designated jobs.

There was a high degree of homogeneity in the farm mechanics jobs performed by farmers in all economic areas, with the exception of some soil and water management jobs in Southeast Missouri.

There was a high degree of homogeneity in the farmers opinions as to whether they should perform the designated jobs in all economic areas.

There was a high degree of homogeneity in the expressed needs of farmers for additional training in all economic areas.

The tenure status of farmers had no effect upon the farm mechanics jobs performed, upon their opinions as to whether farmers should perform the designated jobs, or upon their desire for additional training.

The average size of farm, as reported by 421 farmers, was 440.5 acres. Part-owners farmed 471 acres compared to 396 acres for renters and 395 acres for full owners.

The size of shop was reported by 236 farmers, the average size of home shop was 418 square feet of floor space.

The farms studied were highly mechanized with 2.31 tractors per farm, 1.67 cultivators, 1.65 moldboard plows, 1.34 disc harrows, and 1.15 mowers. The other machines averaged less than one per farm.

The farm mechanics tools and equipment in rank order of ownership were: Concrete finishing tools, 1/2 inch power drill, power handsaw, chain saw, power grinder (1/2 Hp. or larger), fire extinguisher, 1/4 inch drill, tap and die set, grinder (under 1/2 Hp.), air compressor, drill press, pipe threading tools, paint sprayer, arc welder, table saw, forge, portable electric grinder, battery charger, electric sander, timing light, spark plug tester, jig saw, surveyor's level, radial arm saw, oxy-acetylene welder, 3/8 inch drill, wood lathe, power hacksaw, bandsaw, steam cleaner, and metal lathe.

CONCLUSIONS: Farmers in Missouri perform the same mechanical jobs regardless of where they live, with the exception of some soil and water management activities in Southeast Missouri.

Tenure status has no effect upon the farm mechanics jobs performed by farmers in Missouri.

Farmers desire the same type of farm mechanics training regardless of where they live or regardless of their tenure status.

The shops on Missouri farms are inadequately equipped with power tools necessary to perform many farm mechanics jobs.

Farmers perform many farm mechanics jobs in which they are not properly trained.

Farmers are interested in receiving training in farm mechanics skills.

Farmers will perform more of the farm mechanics jobs if they receive proper training.

Microfilm \$3.20; Xerox \$11.05. 245 pages.

DIFFUSION AND RECALL DIFFERENCES BETWEEN TWO WAYS OF SCHOOL-TO-HOME COMMUNICATIONS.

(L. C. Card No. Mic 60-66)

Robert Henry Zeller, Ed.D.
Washington University, 1959

Chairman: Adolph Unruh

This was a study of the effectiveness of two of the more common ways of school-to-home communications, namely,

a written notice sent home with a student and an oral announcement made by a principal at a P. T. A. meeting. Effectiveness referred to the extent of diffusion of the message and the amount of recallable knowledge held by respondents after the lapse of a specific time interval.

The sample of respondents for this study was selected randomly from the P. T. A. rolls of four elementary schools in the Alton (Illinois) Community Unit School District #11. The four schools were located in two separate geographical areas comparable in size, student enrollment, P. T. A. membership, and socio-economic background. The raw data were gathered through a series of interviews conducted by trained interviewers.

Procedurally, the material gathered had the following purposes: (1) to measure the amount of recall of the respondents pertaining to the communication; (2) to determine the source of the respondent's information; and (3) to identify self-designated opinion leaders.

One hypothesis tested in this study predicted greater diffusion among those persons having access to the written notice sent home with the student, but greater recall among those persons having access to the oral announcement made by the principal at a P. T. A. meeting. Another hypothesis predicted greater diffusion and greater recall among opinion leaders than non-opinion leaders. These two hypotheses were based upon the arguments that the written notice would have a possibility of reaching more persons than the oral announcement, but that the motivation to attend the meeting would necessitate a higher degree of motivation to listen and to comprehend the announcement made by the principal. The hypotheses concerning opinion leaders resulted from data from the Katz and Lazarsfeld Decatur study showing opinion leaders to have more information, to be in positions to know more, and to seem to be more interested in public affairs than non-opinion leaders.

Statistical analyses demonstrated that there was not a significant difference in diffusion between the oral notice and the written announcement. This was probably due to the high attendance at the P. T. A. meetings chosen for this study. The amount of recallable knowledge was greater among those persons having access to the written notice than the oral announcement. This was probably because even though the person was motivated to attend the P. T. A. meeting, he was not motivated to listen and to comprehend the announcement made by the principal. Whereas, the mother who received a written notice from her child's teacher would probably give it her undivided attention. Further analyses showed that a larger percentage of opinion leaders attended the P. T. A. meetings, that diffusion was greater among opinion leaders, and that the amount of recall was greater among opinion leaders than non-opinion leaders.

Factors for further study concerning diffusion might include: (1) exposure and motivation as factors in diffusion; (2) the number of channels in relation to diffusion; (3) misunderstanding of messages, whether written or oral; (4) the importance of using opinion leaders as a means of getting information to the general public.

Microfilm \$2.50; Xerox \$6.80. 143 pages.

EDUCATION, ADMINISTRATION

ADMINISTRATION OF PUPIL PERSONNEL
SERVICES IN KENTUCKY

(L. C. Card No. Mic 60-629)

Charles Ambrose, Ed.D.
University of Kentucky, 1957

The purpose of the study was to evaluate the administration of pupil personnel services in Kentucky. The services were selected and then divided into seven critical task areas: attendance and census, pupil adjustment, guidance, health service, assessing pupil progress, pupil activity programs and the program for the exceptional child. The areas were evaluated by using the criteria set forth in this study as being administratively desirable. This criteria was established by a study of the literature in the field and the opinion of twelve field workers in the pupil personnel service from eight different states. Data on the administration of the pupil personnel service was obtained by interviews in thirty selected school districts, of the two hundred and twenty-four, in the state. The interviews were conducted according to a schedule incorporating the criteria advocated in the areas of administrative responsibility for the pupil personnel services.

The study points out that pupil personnel services in Kentucky are handicapped by:

1. An inadequate concept of the functions of this service among school administrators.
2. A lack of sufficient funds.
3. Small ineffective units of school administration.
4. An inadequate concept of social casework relative to working with the problem pupil.
5. A lack of community organization toward help for the pupil with a problem.

The study shows that the pupil personnel directors in the school districts of Kentucky:

1. Administer the program of attendance and census.
2. Do little toward pupil adjustment inside the administrative framework of the individual school.
3. Do little toward administration in the field of guidance.
4. Do little in the administration of the health program.
5. Do not administer the program of pupil assessment.
6. Do not co-ordinate the pupil activity program.
7. Do little toward administration of the program for exceptional children.

In general (with some notable exceptions) the concept of a centrally administered and broadly based pupil personnel service is not found in the school districts of Kentucky.

The major recommendations of this study for the improvement of pupil personnel services in the school districts of Kentucky are as follows:

1. An effort be made to bring together all groups interested in this problem for the purpose of studying and formulating plans for the improvement of pupil personnel services.
2. The administrative status of pupil personnel directors be clarified with regard to their duties and administrative responsibilities.
3. That small ineffective districts be merged into larger units.
4. The position of pupil personnel director be made

a full time responsibility and his duties and responsibilities expanded.

5. That pupil personnel directors be made responsible for the administration of the programs of attendance and census, pupil adjustment, guidance, health, assessment of pupil progress, pupil activity programs and the program for the exceptional child.

The study points out that the pupil personnel service in Kentucky is deficient in relationship to that advocated as being desirable. A program for improvement of this service should be advanced in the school districts of this state. Microfilm \$3.20; Xerox \$11.05. 245 pages.

THE RELATIONSHIP OF GROUP MEMBERSHIPS
TO VOLUNTARY SCHOOL CONTACTS IN
FIVE SELECTED COMMUNITIES OF KENTUCKY
WITH IMPLICATIONS FOR
EDUCATIONAL ADMINISTRATION

(L. C. Card No. Mic 60-632)

James Curtis Bevins, Ph.D.
University of Kentucky, 1955

The study was made to add to the identification of aspects within the community which affect the school program and with which the school administrator must be concerned. The basic problem was to examine the relationships between group participation and interest in school affairs, and from the relationships draw implications for the improvement of educational administration. The degree of group participation was determined by obtaining the number of group memberships and the interest in school affairs was determined by obtaining the number of voluntary school contacts. In the communities where enhancement is obtained more through individual contacts, time spent in educational activities is perceived as a threat to self-organization; whereas, in the communities where enhancement is obtained more through group participation, time spent in educational activities is perceived as an aid to self-organization.

In order to obtain communities that would indicate enhancement more through group participation and other communities that would indicate enhancement more through individual contacts, five counties were selected for study from a rural-urban continuum of all Kentucky counties arranged according to an isolation factor. Each county was considered as a community and the data was obtained by interviewing a random sample of each community.

According to the data, there is a positive and significant relationship between group memberships and voluntary school contacts on a sample-wide basis, according to the rural-urban continuum, and according to the country-city components of each community. Urban people have more group memberships and more voluntary school contacts. The most urban community has more group memberships and more voluntary school contacts than any of the other communities of the study, and in each community the city component reported more group memberships and more voluntary school contacts than did the country component.

The examined relationships between group memberships and voluntary school contacts are suggestive of important implications for educational administration. First,

part of the school administrator training program should be devoted to an understanding of group processes and the techniques of group leadership; experience in these areas is essential. Second, the increase of school sponsored activity should influence the growth of community-wide group participation, with a resultant increase of interest in school affairs.

Due to the highly significant correlation between group participation and interest in school affairs, the school administrator should be under compulsion to have an organized, well integrated program of constructive relations with community groups. A well-planned program of relationships with community groups should result in a minimum of conflict between institutional and group behavior.

Time in the training program should be devoted to the study of differences in patterns of interrelations in communities representing different levels of urbanization.

Also, time should be allocated in the training program for the study of communities in transition, dynamic change in community interrelations instead of a brief study, by description, of the current community setting or status.

Since the schools do not operate in isolation from the community but are an integral part of community interrelations, a portion of the training program should be devoted to such areas of community life as: health education, government, economics, religion, social stratification, recreational patterns, organized community groups, power groups, decision-making processes, and community organization.

Administrators should have experience in methods and techniques of conducting surveys and doing research in an effective and scientific manner. This should minimize effort and time expended in gathering research data on local problems and would aid in preventing an erroneous approach to community problems.

An internship in school administration should be provided so that future school administrators could obtain first-hand knowledge of school-community interrelations.

Microfilm \$2.50; Xerox \$5.60. 115 pages.

A STUDY OF FOUR HUNDRED AND THREE INTELLECTUALLY GIFTED 1957-58 MISSOURI HIGH SCHOOL GRADUATES

(L. C. Card No. Mic 59-6351)

John Everett Bishop, Jr., Ed.D.
University of Missouri, 1959

Supervisor: Loran G. Townsend

PURPOSE

To study a group of intellectually gifted 1957-58 Missouri high school graduates in relation to the following: the high schools from which they graduated; the courses they took in high school; continuation of education and reasons for not continuing education.

METHOD OF RESEARCH:

Any 1957-58 Missouri high school senior who achieved a percentile rank of 98 or higher on the Missouri norms of Form 22 of the Ohio State University Psychological Examination was classified as intellectually gifted. Four

hundred and three 1957-58 seniors were located who achieved a percentile rank of 98 or higher.

The basic data for this study were obtained from information blanks completed by the 403 gifted graduates and their former high school principals and the high school transcripts of the 403 graduates.

SUMMARY:

1. Intellectually gifted high school graduates could not be geographically located in any one section of the state of Missouri but were found in greater proportion in certain sections of the state than in others.

2. The majority of the 127 Missouri high schools graduating intellectually gifted seniors had attained the highest classification possible under the Missouri system of classification. Further, the majority were also members of the North Central Association of Secondary Schools.

3. In general the intellectually gifted graduates took the same subjects during their high school careers even though they did not attend the same school. The 403 intellectually gifted high school graduates earned the majority of their units of high school credit in the areas of language arts, natural science, social studies and mathematics and as a rule took the more advanced courses in these areas. However, a large number of the intellectually gifted graduates did not meet the minimum state requirements in the areas of fine arts and practical arts. A few did not meet the minimum requirements in social studies and physical education.

4. Three hundred seventy-two, or 92.3 per cent, of the intellectually gifted high school graduates continued their education after high school by attending a college, university or other school. Of these 372, 212 attended schools located in Missouri; the remainder, 160, attended schools outside the state of Missouri.

5. Scholarships were offered to 75.4 per cent of the 372 gifted graduates who continued their education and accepted by 60.7 per cent. Scholarship amounts accepted ranged from 62 to 10,000 dollars; however, a number of the scholarships were small.

6. Intellectually gifted students who did not continue their education usually entered occupations of a clerical nature. The two principal reasons offered by this group for not continuing their education were finances and marriage or impending marriage. There was some indication that motivation may have been an important factor in preventing some of this group from continuing their education.

CONCLUSIONS:

1. Intellectually gifted high school students in general take college preparatory courses and as a group present a relatively small variety of courses for high school graduation.

2. Intellectually gifted high school graduates, with few exceptions, further their education by attending colleges, universities or other schools.

3. Scholarships are not decisive factors in whether intellectually gifted high school graduates further their education or not but often determine the choice of school to be attended.

4. A large number of intellectually gifted high school graduates attend colleges, universities or other schools not located in their home state.

Microfilm \$2.50; Xerox \$7.20. 154 pages.

**A CASE STUDY OF THE PROBLEMS OF
RACIAL INTEGRATION IN THE CLINTON,
TENNESSEE HIGH SCHOOL: A STUDY CONCERNED
WITH THE PROBLEMS FACED BY SCHOOL
OFFICIALS IN THE RACIAL INTEGRATION OF
A PUBLIC SECONDARY SCHOOL IN
COMPLIANCE WITH A FEDERAL COURT ORDER.**

(L. C. Card No. Mic 59-6215)

David James Brittain, Ed.D.
New York University, 1959

This study was primarily concerned with the problems faced by school officials in dealing with the racial integration of the Clinton, Tennessee High School. As the result of a federal court order, Clinton High School was racially integrated in the Fall of 1956 and, despite heavy pressures upon school officials, completed the 1956-57 school term as the first publicly-supported and locally controlled integrated secondary school in Tennessee.

This investigation concentrated on the historical background of Clinton; the planning that took place before integration; the nature of forces that supported or opposed school integration; the role of students in the transition period; crucial incidents that occurred; and methods used by school people in dealing with the problems of school integration.

Data were collected from legal documents, research reports, school records, various news media, minutes and records of local organizations, and individuals involved in the integrative process. Thirteen key school officials were interviewed. They were members of (1) the Anderson County Board of Education, (2) the administrative and supervisory staff of the school, and (3) the teaching staff of Clinton High School. Crucial incidents were identified by nine people selected from these areas: (1) public officials of Clinton, (2) administrative and supervisory school personnel, and (3) Negro and white teachers and students.

The investigator found evidence to support the hypothesis that a historical incident of school integration affords insights relevant to school administration and social action programs. As a result of the study, the investigator reached the following conclusions:

1. Planning by school officials should commence as soon as integration is anticipated.
2. The percent of Negroes enrolled in a school is not indicative of the amount of opposition that will develop to school integration.
3. The role that will be accepted by school officials in an integration crisis cannot be predicted upon the basis of their previous experience with integration or segregation.
4. School integration is more likely to succeed if all public and school officials give unqualified support to a definite plan.
5. All citizens should be kept informed of integration plans.
6. Parents, non-parents, students and school officials should participate in developing plans to meet the local situation.
7. Attacks against school integration may range from legal action to physical violence. School officials should use legal means to protect the rights of all citizens.
8. Voluntary community leadership can directly affect the amount and quality of assistance given to school authorities.

9. School officials should include the teaching staff, student body, and adult citizens of the community in making decisions.

10. The influence of adult leadership in a community will affect, and can be affected by, the students during the period of transition.

11. The role of students will depend upon the degree of experiences in democratic living provided by the school program.

12. Regular school attendance by students tends to give support to the school integration program.

13. Existing school organizations should be utilized to develop unbiased attitudes among students.

14. The attitude and conduct of Negro students partially determines the reaction of white students to them.

15. Open and critical discussion of school integration problems by students can be effective in developing proper patterns of student conduct.

16. Impartial, reasonable, but firm, action by school officials are necessary in solving disciplinary problems arising from school integration.

17. School officials should use crucial incidents to stimulate support from students and adults.

18. A loyal and unified faculty and student body are primary requisites to a school integration program.

Microfilm \$4.05; Xerox \$14.20. 315 pages.

**A PLAN FOR COMPREHENSIVE PUBLIC JUNIOR
COLLEGE EDUCATION FOR THE
STATE OF PENNSYLVANIA**

(L. C. Card No. Mic 59-6766)

Kenneth Emerson Carl, Ed.D.
The Pennsylvania State University, 1959

THE PROBLEM

The problem was to ascertain if the assumption that a system of comprehensive public junior colleges could conceivably be the best plan for operation of public junior colleges in Pennsylvania. Such junior colleges could be operated by junior college school districts that have sufficient population and need to maintain adequately sound programs. These junior colleges should provide general education, business education, and all types of vocational and technical education on a continuing, transfer, and non-transfer credit basis to out-of-school youth, high school graduates and other adults.

Another part of the problem was to write a legislative bill for possible submission to the Legislature to carry out the solution of the problem.

PROCEDURE USED

Data for developing the study were obtained from the reports of recent surveys of higher education in seven states. Bulletins, pamphlets, recent junior college legislation, and other research studies were also reviewed.

CONCLUSIONS

1. A system of comprehensive public junior colleges would be an excellent plan for the operation of public junior colleges in Pennsylvania.

2. Comprehensive public junior colleges could be supported by junior college school districts.

3. A minimum population of 300,000 would provide sufficient population to maintain an adequate continuing program of comprehensive junior college education. This would include general education, business education, and all types of vocational and technical education on the continuing, transfer, and non-transfer basis to out-of-school youth, high school graduates, and other adults.

Microfilm \$2.50; Xerox \$7.00. 148 pages.

THE STATUS OF MISSOURI SCHOOL SUPERINTENDENTS, 1958-1959.

(L. C. Card No. Mic 59-6353)

Paul Richard Caster, Ed.D.
University of Missouri, 1959

Supervisor: W. W. Carpenter

Purpose: To study and describe the professionalization of the Missouri school superintendent in 1958-1959 and to note its development over a period of years as revealed by dissertations written at the University of Missouri.

Method of Research: This was a normative-survey, and the data were obtained mainly from an information blank concerning professional training, professional experience, salaries, memberships in professional organizations and readings of professional publications. Four hundred ninety-eight superintendents employed in districts maintaining high schools, or 90.2 per cent co-operated in this study.

Summary:

- (1) Eighty-four and five-tenths per cent of the superintendents received bachelor's degrees from Missouri colleges, and the others from thirty-six out-of-state colleges. Seventy-five and five-tenths per cent received master's degrees from Missouri colleges, and the others from twenty-nine out-of-state colleges. The University of Missouri granted master's degrees to 52.1 per cent of the superintendents included in this study. Three superintendents had received certificates of specialization, one of which was granted by the University of Missouri. Sixteen superintendents had received doctor's degrees, eight of which were granted by the University of Missouri. The number of semester graduate hours of superintendents ranged from twenty-six to 126, and the median was thirty-eight and six-tenths, which was an increase over the groups studied in 1938, 1943, and 1953.
- (2) The median total years professional experience was twenty-three and seven-tenths and the range was from one to forty-seven years. They had a median of ten and eight-tenths years as superintendents and the range was from one to forty-two. The range of experience in their present position was from one to forty years and the median was five and one-tenth. These medians represented an increase over groups previously studied.

(3) The median salary was \$6,162, and the range was from \$23,000 to \$4,200. One fourth were paid \$7,261 or more and one fourth were paid \$5,526 or less.

(4) All superintendents in this study reported memberships in the Missouri State Teachers Association. Next in order of the five named organizations were the Missouri Association of School Administrators, the National Education Association, the American Association of School Administrators and Phi Delta Kappa. The three most widely read of twelve named professional publications were: School and Community, Missouri Schools and The Missouri School Board.

Conclusions:

- (1) Missouri school superintendents have become more professionalized over the last twenty years, when professionalization was evaluated by graduate training, experience as superintendents and experience in the school districts presently employed.
- (2) Missouri school superintendents of 1958-1959, who were employed in Class AAA school districts, were more professionalized than superintendents in other classification groups, when professionalization was evaluated by graduate training, experience, salaries, professional members and professional readings.
- (3) Missouri school superintendents of 1958-1959, who were employed in larger school districts, were more professionalized than superintendents in smaller enrollment school districts, when professionalization was evaluated by graduate training, experience, salaries, professional memberships and professional readings.
- (4) Missouri school superintendents of 1958-1959, who were employed in school districts not reorganized, varied only slightly in professionalization from those employed in Reorganized school districts; however, they had received slightly more graduate training, had been in position longer, had larger salaries, had more memberships in professional organizations and had read more professional publications.

Microfilm \$3.65; Xerox \$12.85. 283 pages.

LEGAL LIABILITY FOR INJURIES SUSTAINED IN A PUBLIC SCHOOL PROGRAM OF INTERSCHOLASTIC ATHLETICS

(L. C. Card No. Mic 60-403)

Cleet C. Cleetwood, Ed.D.
Duke University, 1959

Supervisor: E. C. Bolmeier

The purpose of this study was to discover and interpret the legal liability of the school district, school board members, and school employees for personal injuries sustained by participants and spectators in public school

interscholastic athletic programs. The general legal background of tort liability was presented with reference to judicial decisions upholding or varying from the general principles of case law. The case-study technique was employed in analyzing all applicable recorded court cases. Pertinent court cases were identified by the use of the American Digest System. The court records were found in the National Reporter System and the state reports.

Courts view the interscholastic athletic program as a valuable and integral part of the public school curriculum. The public schools are not considered insurers of the safety of participants or spectators. Incidental admission fees seldom are deemed sufficient to remove the district from its educational function.

The well-established common-law rule prevails that, in the absence of statutes expressly imposing liability, school districts or school boards are not liable for injuries resulting from the negligence of their officers, agents, or employees. The absolute defense of immunity from liability will be applied whether the injuries are incurred during athletic practice, games, or related activities. Despite widespread criticism of the nonliability rule, the courts are reluctant to weaken it, although a few courts have recognized certain exceptions such as a nuisance, governmental-proprietary function, and liability insurance coverage in the absence of statutory authority. California, Washington, and New York have enacted legislation which has successfully abrogated the common-law rule. Other states have modified it through legislation such as "save harmless" and "safe place" laws.

Board members who act honestly and in good faith while performing discretionary duties within the scope of their authority are not generally subject to liability as individuals. They can be held liable for negligent performance of ministerial acts, and for failure to discharge specific legislative mandates.

Immunity from tort liability enjoyed by school districts and school officers does not extend to school employees or agents. Employees are answerable personally for tortious conduct and are subject to the usual rules of law pertaining to negligence. Because of the relatively hazardous nature of athletics, as compared to certain other areas of the school curriculum, a higher standard of conduct is required of personnel responsible for interscholastic athletic activities.

On the basis of the decisions analyzed, it is apparently advantageous, if not imperative, for all school personnel to become conversant with the laws of their respective states and the positions of the courts regarding their legal liability for injuries.

A school district should not conduct or sponsor athletic activities of a proprietary nature unless it is willing and capable of assuming the consequences of liability.

The states which have effectively abrogated school district immunity by statute have eliminated somewhat the injustices which are inconsistent with the trend of present-day American society. Public schools should not depend excessively on the leniency of the courts to protect them from liability, nor wait for judicial amelioration of the immunity doctrine. Simple but positive statutory enactments carefully drafted by legislators who are cognizant of current practices of risk-shifting by the use of insurance, constitute the best remedy by which both the individual citizen and the state can be protected from the hazards of injury and the risks of liability.

Microfilm \$2.50; Xerox \$8.60. 188 pages.

AN ANALYSIS OF CERTAIN EXTERNAL PRESSURES AFFECTING TEACHING AND CURRICULUM IN SELECTED ELEMENTARY SCHOOLS OF INDIANA

(L. C. Card No. Mic 59-6575)

John Ellsworth Cooper, Ed.D.
Indiana University, 1959

Chairman: Hanne J. Hicks

The Problem

The purpose of this study was to analyze the nature, sources, results, purposes and methods of application of pressures originating outside the classroom but within the community which affected elementary teaching and curriculum.

Collection and Analysis of Data

Data were supplied from questionnaires and interviews with elementary teachers, elementary principals, and superintendents of eight second and third class Indiana cities.

The analysis was divided into three sections: (1) external pressures affecting teaching time activities, (2) pressure sources affecting elementary teaching and curriculum, and (3) practices and policies affecting external pressure control.

External pressures. Teaching time activities influenced by external pressures were organized into five categories: (1) student welfare, (2) school or PTA promotional, (3) charitable, (4) assemblies and programs, and (5) other teaching interruptions.

Influences on these activities varied widely in many instances, particularly as school systems were compared.

The most beneficial activities in the judgment of the respondents were safety programs sponsored by the local police and fire departments and visits to class by parents, administrators, and supervisors.

Ticket sales and passing printed matter were practices which were considered to be a waste of teaching time by the majority of respondents in most of the cities.

Pressure sources. Fifteen sources of external pressure were identified and studied. The most powerful of these appeared to be the education profession itself, the PTA, and parents and laymen. Racial and religious pressures were particularly challenging because of their complex emotional implications.

Pressure control. Consideration of pressure control was directed to four aspects: (1) system-wide internal practices as pressure affectors and deflectors, (2) system-wide policies and practices affecting pressure control, (3) system-wide policies and practices affecting school-community relations, and (4) individual school policies and practices affecting school-community relations and pressure control.

Some system-wide practices contributed to the control of pressures; others actually generated them.

Although all of the superintendents favored system-wide written policies to regulate external requests involving the schools, only four systems had compiled such policies in handbook form.

A number of practices were utilized to control external requests. However, no system had developed written criteria for evaluating the merit of such requests.

In six of the eight cities lay committees advised the board of education on various matters.

Individual school policies and practices both of an internal and external nature constituted important factors in the shaping of school-community relations and the establishing of pressure controls.

The majority of teachers participating in the study reported their schools were administered democratically in regard to the determination of policy, the selection of objectives, and the study of problems in faculty meetings.

Major Conclusions

Some of the more important conclusions are listed:

1. Elementary teaching and curriculum were subjected to numerous influences originating from many community sources.
2. In a number of instances the same pressure source exerted both constructive and detrimental influences on elementary education.
3. Some pressure sources were not recognized or were interpreted differently on the level of the elementary teacher and principal than on the level of the school superintendent.
4. Pressures which were easiest to channel for constructive ends usually originated from the desire to serve the best interests of the child, the school, and the community.
5. Pressures which were most difficult to control usually generated from financial desires and from emotional responses to deeply held convictions.
6. A trend was developing toward the increased use of lay committees to act in advisory capacities for the solution of educational problems.
7. Some lay advisory committees were functioning to aid in the control of external pressures.

Microfilm \$4.20; Xerox \$10.35. 327 pages.

STUDENT EXPECTANCIES OF THE UNIVERSITY AND THE RESIDENCE HALL

(L. C. Card No. Mic 60-729)

Annis Eileen Cozart, Ph.D.

The Ohio State University, 1959

In this research study an effort was made to establish women students' reasons for acquiring a college education and to ascertain the parents' expected benefits of higher education for young women.

The research group of 944 freshman women were residents of Ohio, had graduated from Ohio high schools in the spring of 1958, and had no previous college experience. The median age of the student population was 18 years and 3 months. The population was predominantly white, of the Protestant faiths and mainly from communities ranging from 5,000 to 1,000,000 population. The largest proportion

were enrolled in the College of Arts and Sciences and were mainly grouped in Class III, the 30th to the 69th percentile of The Ohio State Psychological Examination, the majority of whose parents did not attend college and whose fathers' occupations were most frequently classified in the managerial group of gainfully employed workers.

An open-end questionnaire was sent to the parents during Autumn Quarter 1958, and a questionnaire to the students was presented through the student assistant program, a function of the freshman orientation and counseling program. The questionnaire submitted to the students included incomplete statements: (1) "I should like to have the residence hall life help me develop the following:" and (2) "I chose to attend college for these reasons:" The question asked of the parents was, "What benefits do you desire your daughter to gain from college attendance?"

Data were grouped in the Personal, Educational, and Human Relations areas and were classified by five variables: size of community, father's occupation, parental attendance at college, The Ohio State Psychological Examination Class groups, and the college of the freshman women students. Numbers and percentages were utilized in presenting the findings. The comparative analyses of the statements were made according to student-parent expectancies of the university program and the student expectancies of the university and the residence hall.

The function of the university was noted in the Educational area and the contributions of the residence hall were made within the Personal and Human Relations areas. The parent group indicated the expressed desired benefits of college attendance to be mainly in the Educational area, with specific emphasis on the provisions for general education and for vocational education. In each subgroup by N variables, the greatest emphasis was placed on the vocational phase as a contributing factor of the university. The pattern indicated by the student consisted of a primary concern for the general education phase and a secondary emphasis on vocational education. Within the Personal area the parents noted the group related traits as important. Comparing this with the Human Relations area, emphasized by the students, the parents tended to define the values more specifically: development of responsibility, tolerance, respect and unselfishness. These items received the same degree of emphasis within the student group; but the students, on the whole, defined the values in more general terms as development of social relationships. The student group emphasized the development of friendships as an expectancy of the university. The development of independence and the development of individuality, personality, maturity and character were indicated as vital responsibilities of the university by both groups.

The students represented the residence hall as a contributing source to the total educational program and established its role in the Personal and Human Relations areas. Items noted as important functions of the residence hall tended to be those centered in group living, group understanding and in the development of personal characteristics which would help the individual be more tolerant, responsible, considerate, friendly, independent and unselfish in living and adjusting to personalities and to new situations. A unique function of the residence hall was the desire for assistance in the development of study habits.

Agreement was seen in the relationship of parent values

and freshman women values of a college education. The student viewed the residence hall as a unique contributing factor to the total university or college community.

Microfilm \$3.20; Xerox \$11.25. 248 pages.

EDUCATIONAL ACTIVITIES OF CHAMBERS OF COMMERCE IN TEXAS

(L. C. Card No. Mic 59-6738)

Carlton Berrymon Downing, Ed.D.
The University of Texas, 1959

Supervisor: Dr. Laurence D. Haskew

This study falls within the general field of the relations of schools to the public. It is concerned specifically with the interplay between the schools and one of the potent community-based organizations, the local Chamber of Commerce. The study is presented in its social context against a backdrop of the historical development of the American community school.

One instrument of inquiry was directed to managers to determine the scope and frequency of Chamber of Commerce assistance to public schools in Texas. The check list contained sixty-six specific items in nine major areas of assistance. To facilitate comparisons of the percentages of managers checking each item, the cities in the study were divided into four population groups. In general, it appears that the local Chamber of Commerce is the organization through which the citizens of a community channel much of their assistance to schools.

A second inquiry was directed to superintendents of schools in cities with Chambers of Commerce to determine their reactions to the assistance received. Their responses make it clear that students, teachers, and school administrators have little reluctance in accepting or requesting assistance from the Chamber of Commerce. There appears to be little relationship between the size of the city and the appraisal of Chamber of Commerce assistance by superintendents of schools. Schools in the smaller cities appear to receive more material assistance, while the schools in larger cities appear to receive more assistance with programs for school and lay groups.

A third instrument of inquiry, directed to members of education committees of the Chamber of Commerce, was designed to measure "Chamber of Commerce opinion" of eleven aspects of public schools selected as representative items of current interest. The inquiry form permitted members to express approval, moderate approval, or disapproval of each aspect. Four of these opinions were the choice of more than three-fourths of the respondents, and five other opinions were the choice of more than fifty per cent of the respondents. The greatest criticism was directed at over-emphasis in athletics, the lack of ability of students to spell, and discipline in schools. The total responses indicate a high degree of uniformity of opinion among the respondents.

A comparison of the percentages of responses for the four population groups reveals that Chamber of Commerce opinion concerning the selected aspects of schools is little affected by the size of the city. A comparison of the percentages of opinions from West Texas, East Texas, and

South Texas reveals only small differences of opinion, but West Texas had the highest percentage of responses for the items considered to express approval of the school program, while the respondents from South Texas had the highest percentage of responses considered to express disapproval. Microfilm \$2.70; Xerox \$9.45. 208 pages.

A PROGRAM FOR PREPARING SECONDARY SCHOOL PRINCIPALS IN IRAQ

(L. C. Card No. Mic 59-2788)

Taha Haj Elias, Ed.D.
University of Maryland, 1958

Supervisor: Professor Clarence A. Newell

This study deals with the formulation of a program of professional preparation for prospective secondary school principals in Higher Teachers College in Iraq.

The descriptive and historical methods were used in this study. The study includes: first, a brief history of the educational system in Iraq, its development, progress, and present status; second, a brief presentation of the competencies that school principals need in order to be well qualified for the position; third, a description and appraisal of the certification requirements in several states of the United States; fourth, a study of the programs in educational administration in several American universities including the courses they offer in educational administration, the requirements for admittance into these courses, and the promising practices that they have; and fifth, a recommended program for professional preparation of secondary school principals in Iraq.

The general conclusions of the study are:

1. Educational administration in the United States has become an established part of the profession of education, and a considerable amount of preparation and experience is required if effective results are to be expected from the work of the practitioners.
2. Secondary school principals need to be prepared in the means of working with people democratically and effectively as well as in the techniques of educational administration.
3. School administrators in the United States are being prepared also in areas which are related to educational administration and which are essential for the smooth and effective operation of schools.
4. Teaching experience is considered essential for success in school administration.
5. Secondary school principals in the United States are expected to be specialists in educational administration and generalists in related areas such as psychology, philosophy, economics, political science, sociology, and similar areas. This expectation seems to be reasonable in Iraq, also.
6. The programs of educational administration which are offered in many universities in the United States offer a good variety of courses in educational administration as well as in areas related to it.

7. Educational administration is dynamic, and that is why it still is undergoing experimentation and revisions in most of the universities in the United States where it is offered.
8. In the case of the educational system in Iraq, one of its chief weaknesses is its structure which makes it less functional and less democratic. To make education more stable, more democratic, and more functional, the educational structure in Iraq should be revised and should be brought as close to the people as possible so that they could assume an active role in organizing and administering it.
9. Secondary school principals in Iraq do not have adequate professional preparation at the present time.

If the present weaknesses are to be corrected, school principals for the schools of Iraq should be carefully selected and well prepared in order that the schools can achieve the real objectives of education.

Microfilm \$3.05; Xerox \$10.60. 234 pages.

ACHIEVING CURRICULUM CHANGE THROUGH ECONOMIC EDUCATION—A FIELD STUDY OF SELECTED SCHOOLS

(L. C. Card No. Mic 59-5322)

Moe L. Frankel, Ed.D.
Rutgers University, 1958

This thesis is a study of curriculum change in four school systems: Ridgewood, New Jersey; Akron, Ohio; Fort Dodge, Iowa; and Kalamazoo, Michigan. The four school systems are part of the Cooperating Schools Project of the Joint Council on Economic Education which is directly concerned with improving the general education program of schools through an appropriate emphasis upon economic education. This study presupposes that economic education is an area that is part of the experience of each grade level, and that patterns of curriculum change developed in this area are applicable to any other area of learning.

In this study, the purpose is not to present new data. Rather, an examination was made of how the schools organized to undertake curriculum change in grades one through twelve, how they investigated what was already being done, how they arrived at decisions on what they should do and to ascertain how they developed a program of action designed to put such decisions into effect.

Data for this study were gathered through personal visits to each school system and examination of written reports which were submitted systematically by each school system. Since each school system is part of the Cooperating Schools Project of the Joint Council on Economic Education, much information was gathered from conferences with Joint Council staff members who took part in the project.

To study the developing patterns of curriculum change, correspondence between teachers, administrators and economic education coordinators and the Joint Council staff was examined.

In order to arrive at conclusions concerning material

development, teachers in each of the four school systems were asked to submit copies of materials they developed for use in their classrooms. These were studied and analyzed.

Communications within the schools, such as memorandums, notices, reports, correspondence, and program announcements were submitted for this study. Correspondence and communications between the schools and lay members of the local community were made available for study to help determine the relationship between community participation and effective curriculum change.

Minutes and programs of conferences held for economic education coordinators of the Cooperating Schools Project were studied as well as reports from specialists who served as consultants to the school systems during the project.

Each cooperating school system was asked to exchange materials and ideas developed to test and retest the applicability of such materials and ideas to a variety of school and community situations. Evaluations made by teachers and coordinators were carefully examined.

Significant conclusions from this study include the following:

1. Effective curriculum change results through democratic planning, organization and behavior.
2. Any system-wide attempt at curriculum change begins with administrative, including Board of Education, approval and involvement.
3. Curriculum change is accomplished only by a recognition of the need for change and willingness to change on the part of teachers, pupils and the community as well as administrators. Recognition and willingness results when all are involved in every step of curriculum change.
4. Funds must be appropriated in the school budget to insure initiation and completion of studies undertaken for curriculum change.
5. Evidences of curriculum change are not uniform throughout a school system. Each program will progress at the rate at which those working on it can grow and learn.
6. An integral part of a successful curriculum change program includes in-service programs, appropriate consultants, effective communication channels, and a situation where recommended changes can be translated into action and practice immediately.
7. Finally, evaluation, initiated at the beginning and continued throughout, is a necessary part of any successful curriculum program included as a part of the regular school program.

Microfilm \$2.50; Xerox \$8.60. 190 pages.

**A STUDY OF THE PERSONNEL FACTORS
AMONG THE SCHOOLS AND TEACHERS IN
THE LONG BEACH PUBLIC SCHOOLS**

(L. C. Card No. Mic 59-6220)

Murray Gilbert, Ed.D.
New York University, 1959

The Problem

The purpose of the research was to study the personnel factors among the schools and teachers in the public schools of Long Beach, New York. In addition, this research investigated the relationship between the morale status of teachers and supplemental employment.

The study was limited to the professional personnel of the public schools of Long Beach, New York, who responded to the personnel factors included in an itemized series of inventories.

Basic Assumptions

It was assumed that an indication of morale status could be made by an evaluation of the opinion of teachers, that high morale is necessary for an effective educational program, and that the quality of the educational program is influenced by the personnel factors of the school district.

Procedures

In 1953 an interdepartmental committee of the School of Education at New York University explored problems in the area of educational personnel and found little that revealed the factors which affect the morale and productivity rate of teachers. The committee then obtained the cooperation of 24 school systems in the metropolitan area for a cooperative research-experimental project to gather and interpret personnel data from the different schools. Each of the cooperating schools selected research fellows to gather, to analyze and to interpret the data from these schools under the direction of the School of Education of New York University.

Seven morale instruments, developed by the research fellows and a group of graduate students in an Educational Personnel Seminar at New York University, were used to collect the data. The basic morale instrument in this group contained items in the broad areas of (1) the teacher as a person; (2) the teacher in relation to pupils, parents and the community; and (3) the teacher as a professional person in relation to the board of education, school administration, and the staff.

The instruments were distributed to all teachers in the Long Beach Public Schools. Approximately 65.5 per cent of the teaching staff responded.

Results

Positive and negative attitudes for the schools and school system were revealed. The responses disclosed that the morale status of teachers in each of the schools of Long Beach differs. The median morale tendency score of each school follows:

Secondary Schools	Median MTS
G-2	63.8
G-4	67

Elementary Schools

Median MTS

G-6	64.5
G-7	85.3
G-8	72
G-9	70.3

No evidence was found which indicated any significant relationship between the morale status of teachers and extracontractual positions.

Recommendations

Recommendations for the schools and school system arose from what the teachers said about themselves, the schools and the community. Such recommendations include investigation of the causes for the low percentage of positive or favorable responses to 43 items of the teacher opinionnaire; employing consultants in areas of administrative practises and communications within the school system; appointment of a Director of Personnel; and immediate study of the 12 items of the teacher opinionnaire on which 60 per cent or more of the teachers responded negatively

Microfilm \$3.90; Serox \$13.75. 301 pages.

**ADMINISTRATIVE PRACTICES WHICH
PROMOTE EFFECTIVENESS IN
PUPIL TRANSPORTATION PROGRAMS**

(L. C. Card No. Mic 60-746)

Walter George Hack, Ph.D.
The Ohio State University, 1959

It has been generally assumed that one method by which school districts could improve their own pupil transportation programs was by the adoption of practices used in those districts that had an effective pupil transportation program. The present study isolated those practices characteristic of effective pupil transportation programs as opposed to those practices characteristic of ineffective programs.

The components of an effective pupil transportation program were first determined by a survey of the literature conducted by the writer and by a free response questionnaire submitted to selected professors of educational administration. An instrument was developed for the purpose of identifying practices of effective pupil transportation. This was done by a survey of the literature to ascertain the practices already identified. The instrument was then submitted to a jury of nine national experts and to the state directors of pupil transportation programs in the 48 continental states. On the basis of their reactions the instrument was refined through the deletion of items not followed by a majority of both the experts and the state directors, as well as by adding items suggested by them. The questionnaire thus revised was submitted to former superintendents of schools in Ohio who had administered a pupil transportation program. On the basis of reactions from this group, several changes were incorporated in the format of the questionnaire in order to improve its clarity.

The Supervisor of Pupil Transportation for the state of Ohio was asked to select 50 school districts with effective pupil transportation programs and a like number with ineffective programs. These districts were then classified according to size, legal type, wealth, terrain, and location. Of the one hundred superintendents of the selected districts, usable responses were obtained from 90. These responses indicated whether the individual districts followed the given practice, the degree of value the superintendents held for the practice, and to what extent the districts used the practice.

The responses of the group of effective districts were compared with those of the ineffective districts. To further sharpen the contrast, the responses of the districts designated by the Supervisor as most effective were compared with the responses by the districts designated as most ineffective.

It was found that effective districts not only followed more of the practices than did the ineffective districts, but also held the practices in higher regard and used them to a greater degree. The contrast in these three aspects was even more marked when the most effective districts were contrasted with the most ineffective.

In regard to the practices characteristic of the effective districts as compared with those of the ineffective, the study revealed that the effective districts were characterized by practices pertaining to policies, pupil behavior, and records and reports. Those practices that characterized ineffective districts were related to the vehicle, maintenance and service, driver, routes and schedules, and records and reports. In general, the practices characteristic of the effective districts were rated (by the state directors of transportation) as being more important than those practices characteristic of ineffective districts.

Microfilm \$4.65; Xerox \$16.45. 362 pages.

A COMPARISON OF THE SOCIAL STANDING AND THE LEADERSHIP IMPORTANCE OF THE LEADERS OF FIVE SELECTED COMMUNITIES WITH IMPLICATIONS FOR EDUCATIONAL ADMINISTRATION

(L. C. Card No. Mic 60-662)

Palmer L. Hall, Ed.D.
University of Kentucky, 1955

The study is a problem of research in the nature and dynamics of community development. It deals with community leadership structure and the relationship of leadership to social standing and prestige, and the effects which existing relationships may have on Educational Administration.

Statement of the Problem. The relationship of leadership importance and social standing and the variance according to the community standing on the isolation scale is studied.

Findings. It was found that none of the six status characteristics suggested by William Warner as reliable criteria for determining social class status was included in the five characteristics deemed most important in lending social standing or prestige in either of the five communities. Four characteristics, viz: leading upright life,

friendliness and personality, people you associate with and community service were included in the five most important in each of the five communities. Either family background or personal accomplishments completed the five.

Conclusions. Rural and urban communities tend to differ as to the importance attached to various characteristics which lead social standing or prestige to one in the community. Although there is apparent agreement on the five most important, there is evidence that they differ considerably as to the way some of the characteristics are interpreted.

The over-all picture presented by the data indicates that there is a positive relationship between leadership importance and social prestige and that there is greater correlation between the two in the more urban communities.

Implications for Educational Administration. This study indicates that the gap between the leadership importance and the social prestige of community leaders is wider in the more rural communities than in the more urban. Many of the leadership activities of the more rural communities revolve around the elected officials, and long residence in the community is the social value which contributes most toward the election of a public official, in these communities. This indicates that the more rural community is less integrated socially, and that the failure of these leaders to exemplify the important social values of the community results in a closing of communication channels, greater conflicts in community activities and less democratic interaction. This situation may make the successful operation of a democratic, community school more difficult. Important leaders in these communities will probably stress the first function of the school, that of preserving and transmitting the culture and resist attempts of the school to fulfill its second function, i. e., facilitating change and adjustment to new situations.

Microfilm \$2.60; Xerox \$9.00. 199 pages.

TOP-LEVEL ASSISTANTS TO THE SUPERINTENDENTS OF MISSOURI PUBLIC SCHOOLS AND THEIR QUALIFICATIONS

(L. C. Card No. Mic 59-6356)

Forrest William Harrison, Ed.D.
University of Missouri, 1959

Supervisor: W. W. Carpenter

PURPOSE: To obtain recent data concerning the status of top-level assistants to Missouri superintendents of schools.

METHOD OF RESEARCH: Primary data were obtained through the return of information blanks from top-level assistants to Missouri superintendents of schools and from certification officials of the fifty states and the District of Columbia. Assistants in the cities of St. Louis and Kansas City were not included in the 112 Missouri officials studied.

Secondary data were obtained from the Missouri School Directory for 1949-50 through 1958-59 and from a report of a study of salaries and titles of administrators

made by the Educational Research Service of the National Education Association.

SUMMARY:

- (1) The titles used for top-level assistants in Missouri generally were assistant superintendent, administrative assistant, director, and supervisor. During the first five years of the period studied, all titles increased at approximately the same rate; but during the last five years, the number of titles of assistant superintendent and director increased more rapidly than did titles in the other two categories. The number of top-level assistants in Missouri increased from 19 to 112 during the ten-year period.
- (2) The term used most in the titles of top-level assistants studied was assistant superintendent. About half of the titles designated areas of responsibility.
- (3) In the sixty-four districts studied, top-level assistants were employed in a ratio of approximately 2,000 pupils per top-level assistant.
- (4) the 112 Missouri assistants had earned ninety-four master's degrees and ten doctor's degrees. A majority of the master's degrees and 70 per cent of the doctor's degrees had been granted in 1949 or later.
- (5) The median salary reported by top-level assistants studied was \$7,833. The mean salary was \$7,625. Generally, the median salary increased as the levy of the district increased, as the number of teachers employed increased, and as the number of pupils enrolled in the district increased.
- (6) Certification requirements for top-level assistants usually were the same as requirements for superintendents.
- (7) About half of the certification officials believed that colleges and universities were training top-level assistants adequately, but they were not agreed that certification problems were being handled adequately by the training institutions.

CONCLUSIONS:

- (1) The major portion of the development of positions of top-level assistants to Missouri superintendents of schools, outside the two largest cities, occurred after 1949.
- (2) The principal areas of responsibility assigned to Missouri assistants were elementary education, business affairs, and instruction and curriculum.
- (3) With degrees, hours of credit, and recency of graduate training used as criteria, it appeared that Missouri assistants generally were well trained for their positions; however, 10 per cent or more who did not furnish complete information possibly were not qualified for the positions they held.
- (4) Top-level assistants appeared to be appointed in districts where the electorate desired improved service and were willing to tax themselves at a rate higher than the average for Missouri districts.

RECOMMENDATIONS:

- (1) Top-level assistants should hold superintendent's certificates and should have adequate training in the areas of responsibility assigned to them.
- (2) Boards of education should include in their rules and regulations qualifications for top-level assistants and should select those officials from nominations made by the superintendent, as other professional staff members are selected. Assistants should be made responsible to the board of education through the superintendent and should work under his immediate direction.
- (3) Graduate training programs for top-level assistants should be approved by an accrediting agency acceptable to the American Association of School Administrators.

Microfilm \$2.50; Xerox \$8.60. 190 pages.

THE LEGAL ASPECTS OF SCHOOL DISTRICT REORGANIZATION IN INDIANA

(L. C. Card No. Mic 59-6581)

George Joseph Huys, Ed.D.
Indiana University, 1959

Chairman: Marion A. McGhehey

Problem: The purposes of this study were to (1) determine the constitutional provisions relative to school district organization and reorganization, (2) analyze the various reorganization statutes in order to trace changes in state policy relative to school district reorganization, (3) analyze the interpretation of the law concerning school district reorganization found in court cases in both courts-of-record and courts-not-of-record, (4) review the Official Opinions of the Attorney General of Indiana, and (5) review administrative rules and regulations.

Procedure: An examination was made of the Indiana Constitution of 1851 to determine the constitutional provisions relative to school district reorganization in Indiana. The Indiana Sessions Acts were used to identify the school district reorganization acts, and these acts were analyzed as to (1) applicability of the act, (2) mechanics of procedure prescribed in the act, and (3) powers vested and the duties imposed by the act. The Official Attorney General Opinions were examined, and citations were made under the specific statute concerned. Various legal sources were used to locate court cases of courts-of-record, and these cases were analyzed. Materials concerning the litigation on school consolidation which came before courts-not-of-record were secured from the consolidated school corporations involved, and these materials were examined to determine the law based on the court decisions. Finally, administrative rules and regulations were examined to locate provisions applicable to consolidated school corporations only.

Conclusions: Based upon the findings the conclusions were as follows: (1) the only constitutional provision relative to school district reorganization is to be found in the general mandate to the General Assembly to provide, by

law, for a common school system, (2) the changes in state policy toward school district reorganization, (3) the General Assembly is recognizing the possible need for mandatory legislation to provide adequate school districts, (4) the court cases to come before-courts-of-record have set forth principles of law, (5) court decisions in courts-not-of-record have generally been favorable to consolidated school corporations, and (6) requirements are being enforced by administrative agencies which are not published as required by law.

Microfilm \$3.80; Xerox \$13.30. 295 pages.

A TIME STUDY OF THE SHORTHAND TRANSCRIPTION PROCESS

(L. C. Card No. Mic 60-440)

Donald D. Jester, Ph.D.
Northwestern University, 1959

Chairman: Russell N. Cansler

Statement of the Problem

This study identified and analyzed the numerous activities which go to make up the totality of the shorthand transcription process. The following specific elements of the transcription process were studied in detail:

1. The exact time consumed by each individual activity of the overall transcription process.
2. The frequency with which each activity occurred in the overall process.
3. The speeds with which certain activities of transcription were performed.
4. The sources of information consulted by transcribers in solving the problems of transcription.

Procedures

In order to obtain data about the transcription process, time-study techniques were employed. Thirty-six second-year shorthand students transcribed five letters each. During the transcription process, they were timed on their performance of each of the transcription activities, such as the typing activity, erasing, deciphering poor shorthand notes, proofreading, dealing with spelling problems, making ready, and others. This procedure identified the frequency with which each activity occurred and it also supplied exact measurements of the time intervals of each individual activity.

Findings

The data revealed that transcribers spent 38.1 per cent of their time performing the typing activity of transcription and 61.9 per cent of their time performing various non-typing activities. The ten major non-typing activities of transcription included the following:

Rank	Activity	Per cent of time
1	Erasing and correcting	16.8
2	Proofreading and correcting	7.5
3	Deciphering incorrect shorthand outlines	6.2
4	Reading shorthand notes for context and meaning	5.1
5	Making ready	3.9
6	Dealing with spelling problems	3.8
7	Deciphering poor shorthand penmanship	3.3
8	Supplying and verifying inside addresses	3.0
9	Supplying miscellaneous fill-in information (exclusive of information for letter parts)	2.5
10	Dealing with tabulation problems	1.7

Conclusions and Implications

The findings of this study have particular significance to teachers of shorthand and transcription. Transcription training must include more than drill in typing from shorthand notes if it is to be effective. It must include training in the performance of the non-typing activities of transcription. Greater than the factor of typing speed to the overall speed of transcription is the factor of speed and efficiency in performing the non-typing activities.

Because of the problems posed by the necessity of using reference materials in transcription, direct training in their use should be an important consideration in the teaching of transcription. Students need practice and experience in taking addresses from incoming letters and address files, in locating invoice numbers, in finding information in a simulated company manual, in checking and verifying names, numbers, and amounts, and in generally working in the context of a simulated office situation.

The identification and solution of shorthand problems occupied an important place in the overall transcription process. Consequently, throughout the shorthand training, the importance of writing correct shorthand outlines should be stressed. Training in shorthand theory should not be neglected for training in typewriting or English which can be accomplished by the courses directly designed for the teaching of those skills and knowledges.

Microfilm \$2.50; Xerox \$6.80. 144 pages.

THE ROLE OF THE SCHOOL IN THE COMMUNITY

(L. C. Card No. Mic 60-670)

Raymon Dudley Johnson, Ed.D.
University of Kentucky, 1952

PROBLEM, PURPOSE AND DELIMITATIONS

This study is one of several conducted by the Southern States Cooperative Program in Educational Administration, and financed by a grant from the Kellogg Foundation. Its purpose was to determine laymen's and professional educators' concepts of the role of the school in the community. The problem deals with "The Role of the School in the Community" and was limited to the community of Cheatham County, Tennessee.

Basic Assumption

Schools, as an agency of the community, have a responsible role to play in the community.

Need for the Study

There is a need for a study to determine the responsibility of the school to the community in the areas of school relations and administration procedures, with particular regard to the economy of time, effort, and financial expenditure.

Procedure in Collecting Data

The data were collected through personal interview of representative laymen and professional educators. The sources included a 25 percent sample of the members of the county court, 85 percent of the professional educators employed within the county, and a random sampling of the people of the county. The latter group was sampled, using an official road map and interviewing every 48th house. If the 48th house was the home of one interviewed in another group the next house was used and the count reverted to the original plan.

A structured questionnaire was used and answers were recorded as received. Personal data was collected on each interviewee.

Procedures in Treatment of Data

Responses to each question were typed on a separate coded card. After general categories had been established, responses were tabulated under the categories which were most applicable. Results were compiled in table form. The following information was gleaned from these data:

1. Concepts expressed by laymen and professional educators in Cheatham County were compared.
2. On the basis of the findings, implications were drawn for educational administration in Cheatham County.
3. General implications were drawn for educational administration.

Other Implications

There are some implications which may be applicable to other school districts. From data in this study it seems reasonable to draw the following implications:

First, the community is willing to do its part but is not allowed to do so.

Second, broad development in a program of education is desirable rather than the traditional "3 R's."

Third, considerable agreement exists between laymen and teachers as to the role of the school in the community.

Fourth, data for research purposes are readily available through the interview technique.

These implications may be considered to be hypothesis for school systems similar to the district studied. Through other studies of a like nature in other school systems these implications may be validated and used as operating principles in securing school improvements. Improvement programs, if they are to be successful, must recognize the concepts held by all citizens concerning their schools. Such information should serve as guideposts so that the work of the entire professional staff may become more effective. Microfilm \$2.50; Xerox \$5.80. 116 pages.

POLICY DECISIONS IN THE GROWTH AND DEVELOPMENT OF THE PUBLIC SCHOOL SYSTEM OF PRINCETON BOROUGH, NEW JERSEY.

(L. C. Card No. Mic 58-5727)

Michael Seigel Kline, Ed.D.
Rutgers University, 1958

The Problem

The problem was to identify the policy decisions of the public school system of Princeton Borough, New Jersey to determine why they were made, their relationship to the growth and development of the public school system, and the probable areas for policy decisions in the future.

Purpose of the Study

The purpose of this study was to describe and delineate actual examples of the decision-making or policy-making process, detailing the methods, patterns and procedures employed in actual illustrations of policy decisions by a board of education. Although no two communities are alike, an investigation of this nature may give a clearer conception of the policy-making process and a better understanding of the over-all nature, meaning and purpose of policy decisions in their relationship to the growth and development of a public school system.

Methods of Procedure

The historical method was used to examine and evaluate the data available from the minutes and annual reports of the Princeton Borough Board of Education, as well as data from other sources. Interviews and consultations were held with administrative personnel directly related to each policy-making area. Each area was described in chapter form and reviewed by the Superintendent of Schools and other administrative personnel for validity of facts and accuracy of presentation.

Policy-making areas were identified by noting all statements of policy and grouping these according to the

nature and type of areas treated. Each area was then investigated for data concerning the decision-making factors involved, methods and procedures employed in the development of policy decisions, implementation of the policy decisions, effect of the implementation of policy decisions, and revisions or modifications necessitated because of the effect of implementation.

Summary

Eight major policy-making areas in the growth and development of the Princeton Borough public school system were identified and detailed in chapter form, and included the following:

1. The New Junior-Senior High School (1927-1929)
2. The \$1,770,000 High School Addition (1954-1956)
3. Proposed Consolidation of the School Districts of Princeton Borough and Princeton Township
4. Articulation with Sending Districts
5. Racial Integration
6. Procedures for the Introduction Of Curricular Changes
7. Community Use of the Schools
8. Development of the Administrative Structure

This study also included a summary of essentials in the formulation and implementation of policy decisions, as implied by the experience of the Princeton Borough public school system, as follows:

1. An effective administration-Board of Education relationship based upon mutual respect of lay and professional provinces.
2. Formulation of the policy decision by the administration and Board of Education with the objective of promoting the greatest pupil growth and development while serving the best interests of the community.
3. Formulation of the policy decision after thorough and comprehensive study of a problem area by the administration and Board of Education, utilizing the resources of the staff, community, and professional consultants.
4. Flexibility of the administration and Board of Education in adapting a policy decision to valid reservations of the community, in order to achieve implementation of the policy decision yet meet the needs or desires of the community.
5. Public presentation of the policy decision, which clearly and fairly imparts full information to the community, utilizing public information procedures which effectively present the reasons for the policy decision.

This study was concluded with the indication of future problem areas which may face the Princeton Borough Board of Education. Major problem areas were indicated in the development of cooperative policies and procedures with the Princeton Township Board of Education, and the development of new locations, plants, and facilities for elementary pupils.

Microfilm \$3.45; Xerox \$12.15. 268 pages.

A STUDY OF THE EXTENT TO WHICH SEVERAL FACTORS MAY HAVE CONTRIBUTED TO THE SUCCESS OR FAILURE OF SELECTED MISSOURI HIGH SCHOOL GRADUATES AS UNIVERSITY OF MISSOURI FRESHMEN

(L. C. Card No. Mic 59-6363)

Arthur Lee Mallory, Ed.D.
University of Missouri, 1959

Supervisor: W. W. Carpenter

Purpose: The major purpose of this study was to compare a group of selected 1956-67 Missouri high school graduates as to their success as University of Missouri freshmen on the basis of a number of factors which may have contributed to their success or failure.

Method of Research: Data pertaining to the high schools from which the 634 pupils included in this study graduated were obtained from the Missouri State Department of Education. Ohio State University Psychological Examination scores and high school percentile ranks were taken from the files of Dr. W. R. Carter, Director of the Missouri Aptitude Testing Program. Scholastic marks upon which was based the pupils' success as University of Missouri freshmen were taken from the files of Dr. W. R. Carter and Dr. Charles McLane, Director of Admissions of the University of Missouri.

On the bases of their ability scores and scholarship ranks, pupils were placed in three groups: high ability, high scholarship; high ability, low scholarship; and low ability, low scholarship. Nine factors relating to the high schools from which the pupils graduated were considered in this study.

Summary:

- (1) The most successful of the 429 high ability, high scholarship pupils as University of Missouri freshmen graduated from schools with costs-per-pupil in ADA of \$300 to \$399; graduating classes of seventy-five pupils or more; AAA classifications; forty or more high school teachers; and average salaries of high school teachers of \$4,000 or more. Seventy-seven per cent of the high ability, high scholarship pupils were successful at the University of Missouri.
- (2) The most successful of the 142 high ability, low scholarship pupils as University of Missouri freshmen graduated from schools with costs-per-pupil in ADA of \$250 and above; graduating classes of 100 or more pupils; A classifications; forty or more high school teachers; average salaries of high school teachers of \$4,500 to \$4,999 and \$5,500 to \$5,999; fifty or more approved high school curricular units; and teacher-pupil ratios of 1 teacher to 10-14 pupils. Forty-one per cent of the high ability, low scholarship pupils were successful at the University of Missouri.
- (3) The most successful of the sixty-three low ability, low scholarship pupils as University of Missouri freshmen graduated from schools with costs-per-pupil of \$350 and above; high school enrollments

of 600 or above; graduating classes of 100 or above; AAA classifications; forty or more high school teachers; and average salaries of high school teachers of \$4,000 or more. Eight per cent of the low ability, low scholarship pupils were successful at the University of Missouri.

Conclusions:

- (1) Except for low ability, low scholarship pupils, it appeared that success at the University of Missouri for pupils considered in this study was related to cost-per-pupil in ADA.
- (2) Except for low ability, low scholarship pupils, it appeared that success at the University of Missouri for pupils considered in this study was related to the average salary of high school teachers.
- (3) For the pupils considered in this study there appeared to be a positive relationship between success at the University of Missouri and the number in the high school graduating classes for pupils whose graduating classes enrolled 100 or more.

Microfilm \$2.50; Xerox \$7.80. 167 pages.

ATTITUDES OF SELECTED PROFESSORS AT THE OHIO STATE UNIVERSITY REGARDING THEIR WORK LOADS

(L. C. Card No. Mic 60-767)

James Harold McElhaney, Ph.D.
The Ohio State University, 1959

In this study the investigator attempted to ascertain the attitudes, opinions and judgments of full professors regarding their own work loads and faculty work load in general. Only those in teaching, research, and service were included. Part-time professors and administrators were excluded.

The interview was the major research instrument, supplemented by the questionnaire. Sixty professors from as many departments, 22.7 per cent of 264 potential respondents, were interviewed. Questionnaires went to 160 additional professors, 105 completing and returning them anonymously. University records were sources of factual data. Related research and literature were explored. Correspondence was conducted with other universities.

Findings. Reactions to a proposed new "flexible" University load policy generally were favorable. Almost unanimously approved was "the right to time" for creativity and professional improvement, and the statement that it is the chairman's duty to make appropriate load assignments. Eighty per cent agreed that faculty appointments "should be regarded as full-time responsibilities," but of these one-third had reservations; and 85 per cent approved making exceptions. A forceful 20 per cent opposed the statement. Many expressed dissatisfaction because "full-time" was undefined.

The proposal that all outside activities should have "the understanding and approval" of chairmen and deans was acceptable to 83 per cent, 13 per cent of these with qualifications; but 75 per cent wanted exceptions. Objec-

tions to the principle were voiced by 17 per cent. Questionnaire returns were similar.

Slightly more than half considered their loads too heavy, with insufficient time for research, writing, advising, and improvement of teaching. However, 80 per cent of the overburdened admitted this was voluntary. Sixty per cent signified that extra class activities were not considered when their load assignments were made. Fifty per cent indicated that their loads had been increasing. The majority gave "12 class hours" as their department standard. Official reports of 232 professors revealed an average of 11.8 student contact hours weekly, plus 10 activities.

The average work week estimate was 52.8 clock-hours. Those feeling overburdened averaged 54.96 hours. By contrast, the average professors' estimates of a reasonable work week was 41.76 hours.

The majority cited the reading and grading of papers and examinations as the most "wearing" of all their duties, with committee duties and clerical work close behind. Sixty per cent regarded their offices and laboratories as unsatisfactory. Most professors found work with graduate students especially time-consuming. Eighty per cent thought graduate classes should be smaller than undergraduate. The majority felt the solution to growing enrollments would be increased staff, especially at the lower ranks, plus more graduate assistants and clerical help. More than four-fifths saw need for work load studies.

Recommendations. A survey in depth of the total work loads of all staff members should be conducted. This would include a staff utilization study at departmental levels.

The concept of total load, including all extra class activities directly connected with the professors' assignments, should be recognized, as opposed to traditional evaluations in terms of credit hours or class hours.

A basic minimum standard load should be established in each department, with staff members participating in the policy-making process. Complete work loads of all faculty should be posted or easily available in each department.

Vigorous attempts should be made to solve the problems of excessive committee work, clerical and graduate student assistants, and unnecessary "wearing" factors.

The proposed load policy should be re-appraised, and perhaps re-written, by a committee including teaching faculty members. The "full-time responsibility" statement ought to be clarified.

If possible, time should be found for the research-minded professors (the majority) to keep pace with advancements in their fields--but students' needs must not be neglected.

Microfilm \$5.00; Xerox \$17.55. 389 pages.

RECRUITMENT, SELECTION, AND TRAINING OF CUSTODIANS IN SELECTED PUBLIC SCHOOL SYSTEMS.

(L. C. Card No. Mic 59-6464)

Edward Theodore Michaels, Ed.D.
Temple University, 1959

The major purpose of this study is to determine what practices are followed in the recruitment, selection and training of custodial personnel; which of these practices have been found to be most effective; and to make recommendations concerning the best practices in recruitment, selection and training of custodial personnel.

School selection was made by requesting from recognized authorities in the field, names of schools having successful practices in recruitment, selection, and/or training of custodial personnel.

The Questionnaire evolved as the result of findings reached after the completion of: interviewing nine administrative leaders acquainted with custodial supervision; conferences with three members of the Temple University Educational Administration Staff; reading related literature; actual experience working as a custodian's helper during a summer maintenance program; attending custodial workshops; and interviewing twenty-five school custodians.

The ninety-eight questionnaires returned were tabulated with note made of those returning partially incomplete replies, to assure statistical accuracy. The ninety-eight questionnaires (which represents a 65.3% return) thereby became the basis for this study.

RECOMMENDATIONS

The study of recruitment, selection and training practices of selected school systems, as presented in the preceding chapters of this investigation, indicates rather definitely the need for certain recommendations:

1. An organized series of blank forms should be formulated by each school district so that pertinent information relative to recruitment, selection and training of custodians could be consolidated, recorded and made available for ready reference.
2. School districts should utilize all recruitment media available to assure the greatest possible number of applicants from which to make a selection, and application should be encouraged at all times.
3. All custodial employees should be encouraged at all times to recommend names of persons to be considered for custodial work.
4. School districts should make every effort to publicize all the advantages of working as a custodian in a school district.
5. All phases of custodial recruitment, selection and training should be under the control of one administrator.
6. All references and recommendations listed on application forms should be checked carefully and completely and a record made of all findings.
7. Interviews should be so scheduled as to permit adequate time for an informal type discussion. In addition,

the interview procedure should be planned and provisions should be made for recording all resultant findings.

8. The process of selecting custodians should include the consideration of a number of separate and distinct qualifications with special consideration being given to the applicant's rapport with children and adults.

9. In-service training programs should be organized to accommodate the trainee custodian as soon as he is hired.

10. Research programs and experimental programs should be conducted by school districts utilizing actual working conditions for experimentation and authoritative resources for the research programs.

11. Arrangements should be made to allow custodians to visit other schools, for inspection and observation purposes. Such visitation should be followed by a written evaluation report.

12. Custodial meetings should be scheduled periodically and the agenda should include time for informal discussions, demonstrations and social activities.

Microfilm \$2.50; Xerox \$7.20. 154 pages.

A PROPOSAL FOR CURRICULAR EXPANSION IN PHILIPPINE VOCATIONAL AND TECHNOLOGICAL COLLEGES

(L. C. Card No. Mic 60-691)

Donato Bernardez Pableo, Ed.D.
University of Kentucky, 1955

A series of surveys on the cultural-socio-economic conditions in the Philippines during the last thirty years reveal these important facts: The country has extensive natural resources which are relatively untouched, much less developed for the support of its people; a serious technological lag exists in agricultural methods and in industrial processes; the present curricula in the Philippine educational institutions are inadequate in their vocational and technical offerings.

Among other things, the surveys recommend that Philippine educational institutions should prepare for development and expansion along agricultural lines and for related and essential industries; that greater emphasis should be given to education for economic productivity; that the economic development program of the country should be given constant detailed engineering and economic study; and that measures should be taken promptly to provide for expansion of the power facilities of the country to enhance its technological development.

Philippine educational institutions should participate actively in the proper implementation of these basic recommendations. To meet the actual needs of the people and the normal development of the country, adequate training facilities for leaders in agriculture and industry should be provided. The vast tracts of agricultural land, the hidden wealth in the mines, the extensive commercial forests --all these will not mean much unless they are fully exploited and harnessed to minister to the happiness and comfort of the people. These can only be developed if the

schools and colleges, as agencies for training human power to direct economic development, turn out technically trained individuals who know the improved methods of cultivation and scientific processes of manufacture. This is the challenge to Philippine institutions of higher education.

In this proposal for curricular expansion in Philippine vocational and technological colleges, certain criteria are considered. The economic life of the community should be made the core of the curriculum. School-community relationships should be a cooperative process, since a vocational or technological institution cannot exist apart from the community and be oblivious to the national economic plans intended to create national prosperity and raise the level of living of the people. Curricular expansion should also consider the role of school-community cooperation as giving the latter the necessary help to travel forward under its own power.

The curricular revision is aimed at offering vocational and technological courses which may meet the immediate needs of the country. An institution may adopt only the courses that are best for its purpose. Every institution is expected to take the initiative to improve its curricular offerings which would contribute to the technological development of the country. To guide Philippine institutions of higher learning in this problem was the intent of this dissertation; containing, as it does, specific proposals for basic curricula and detailed courses implementing the recommendations aforementioned.

Any curricular expansion should be in continuous evaluation to stimulate growth and improvement. It should be flexible enough to meet changing trends. Evaluation must always be in terms of goals, as goals focus to the educational process.

The nation's program of economic development demands that greater attention be given to vocational and technological education. The natural resources of the country cannot be adequately developed without the concurrent preparation of its human resources. If the Philippines hopes to be well developed in a permanent and substantial manner, skilled individuals needed for agricultural and industrial enterprises must be trained. They are the backbone of the country's technological development.

The nation should develop skills needed locally and which could be exported. With greater and more serious application, more disciplined effort, increased initiative and industry, and a determined will to achieve, the Philippines shall become a real contributor to the common fund of human knowledge and experience.

Microfilm \$2.50; Xerox \$8.80. 191 pages.

A COMPARISON OF DISTRICT-OWNED AND CONTRACT BUS COSTS IN THE PUBLIC SCHOOLS OF NEW JERSEY

(L. C. Card No. Mic 59-5327)

Orville G. Parrish, Ed.D.
Rutgers University, 1959

1. Statement of the Problem

One of the major problems facing contemporary education is the financing of the public schools. The general problem of the dissertation was to discover means whereby

the educational dollar could be more prudentially expended in the State of New Jersey.

This general problem of the dissertation entailed the following specific problem:

Should school districts in the State of New Jersey, for economy purposes, utilize district-owned or contract buses in the transportation of pupils to and from the public schools?

The thesis presents an objective study of the comparative costs of district-owned and contract school buses used to transport pupils to and from the public schools in the State of New Jersey during the year 1956-57. The buses under study were all operated under the jurisdiction of the local boards of education and the data presented comprise cost figures for all school buses operated in the State of New Jersey. The comparisons are arranged in such a way that local boards of education may readily evaluate the two methods not only from the State averages but also from the averages derived at the county and district levels. The district comparisons, found in Appendix C of the study, further provide the local boards of education with the necessary cost data upon which they may evaluate their present policy and thus determine which system of transportation to use in their district.

2. Procedures of the Dissertation

Data for this thesis were derived by the use of a measuring instrument devised especially for the study. This instrument was in the form of a questionnaire which was pretested, evaluated and revised before being sent to the secretary of the board of education of each school district in New Jersey. One hundred per cent return of the questionnaires was achieved in the study. The questionnaire gathered data from 564 school districts and, through the limiting of the study, this figure was reduced to 383 districts transporting pupils by 501 district-owned buses and 2,285 contract buses.

3. Results of the Dissertation

1. District-owned buses, during the school year of 1956-57, carried on the average one-third more pupils per day per bus.

2. The average yearly per pupil cost of the district-owned bus was fifteen dollars less than the contract bus. Although this study shows that a district-owned bus was more economical to operate on a cost per pupil basis, on cost per vehicular mile, and that an approximate saving of at least \$1,500 a bus, per year, could be realized by districts changing to district-ownership of school buses, contract buses nevertheless outnumbered district-owned buses four to one in the State of New Jersey during the school year of 1956-57.

3. The average district-owned bus operational cost was one-half as much per bus mile as the contract bus.

4. Neither district-owned nor contract systems of bus transportation showed little significant difference in the average yearly operational cost of from one to twenty buses. However, the operational cost decreased sharply when a district operated in excess of twenty buses.

5. The study indicates that when the mileage per year was increased for either system, the cost per bus mile of operation correspondingly decreased.

6. The study indicates that the average district-owned bus that carried less than 70 pupils per day showed poor economy of transportation, average economy could be

achieved by increasing the number of pupils to between 100 and 125 and good economy by transporting above 125 pupils.

4. Conclusions of the Dissertation

1. District-owned school buses are more economical to operate than contract buses.

2. The availability of a district-owned bus during the school day makes possible the enrichment of the educational program of the school.

3. Districts operating under the contract system of pupil transportation should consider owning their own buses.

4. Districts operating with small fleets of buses should, for economy reasons, consider merging with surrounding districts to form one large fleet.

Microfilm \$3.45; Xerox \$11.80. 268 pages.

THE LEGAL STATUS OF THE PUBLIC SCHOOL TEACHER OF GEORGIA

(L. C. Card No. Mic 60-413)

Walter Dean Power, Jr., Ed.D.
Duke University, 1959

Supervisor: E. C. Bolmeier

The purpose of this study was to ascertain the legal status of the public school teacher of Georgia under Georgia general law as found in constitutional and statutory enactments and in decisions of the appellate courts of the State.

It was ascertained that in order to qualify for employment in Georgia the teacher must possess a teacher's certificate issued by the designated State agency. He must give evidence of freedom from subversive influences and must subscribe to the teacher's oath.

The teacher's election is an exclusive prerogative of the employing board of education which may exercise broad discretionary powers in its selection of teachers. A teacher may be elected either with or without the recommendation of the superintendent.

A teacher is legally employed only after proper execution of a written contract. The teacher's contract of employment is generally for a term of one year but may be terminated for lawful cause upon notice by either party to the contract.

The contract of employment is an entire contract, but compensation under the contract may be apportioned. A teacher may not be paid less than the minimum salary prescribed for teachers of his class. He may receive a higher salary than that listed in the minimum salary schedule. He may also be paid for work done beyond the regular school year.

Few of the duties of the teacher are enumerated by statute. Assignment of duties to a teacher is primarily within the discretion of the employing board of education.

In his relationship to the pupil the Georgia teacher stands to some degree *in loco parentis*. The teacher may require the preparation of reasonable assignments, and he may punish the pupil for failure to prepare such assignments and for other acts of insubordination or misconduct.

Reasonable corporal punishment is permissible unless prohibited by rules of the employing board. The teacher will not be held liable for an injury incurred by a pupil under his supervision if he has exercised all reasonable precaution to prevent its occurrence.

The Georgia teacher may be granted a leave of absence without loss of pay for reason of illness. He is entitled to benefits under the workmen's compensation laws of the State for accidental injury or loss of life arising out of and in the course of his employment. He is accorded the basic protection of the old-age and survivor's insurance system of the Social Security Act if employed in a school system in which the teachers have by referendum elected this protection. Through membership in a State retirement system the teacher may qualify for retirement benefits.

The Georgia teacher may be suspended from his position for good and sufficient cause. He is entitled to notice and to a hearing at which he may present his defense. An adverse decision is subject to appeal. The teacher's legal remedy for an improper dismissal is a petition for mandamus.

Certain laws designed to prevent the integration of the races in the schools of Georgia will alter the legal status of the teacher if the contingencies upon which their application depends should occur. A provision which would guarantee the payment of his contract salary upon the closing of the public schools by order of the Governor and another provision which would enable the teacher to continue his membership in the retirement system while employed in certain private nonsectarian schools are particularly applicable to the teacher, but they have not yet altered the status which the teacher has under the Georgia law. Microfilm \$2.50; Xerox \$8.20. 180 pages.

AN EXAMINATION OF THE STATUS AND NATURE OF PHILOSOPHY OF EDUCATION PROGRAMS IN SOUTHERN INSTITUTIONS OF TEACHER EDUCATION

(L. C. Card No. Mic 60-697)

James Walton Rowley, Ed.D.
University of Kentucky, 1950

This study consists, first of all, of an inquiry into the status and nature of philosophy of education courses in the 277 Southern institutions of teacher education, and, second, of the formulation and validation of eight theses concerning the improvement of such courses. A detailed analysis of the history of philosophy of education courses in American teacher education has also been made (although not dealt with here), because of the historical influence of the older Eastern and Midwestern courses on the Southern courses is clear.

Fifty-nine per cent (163) of the Southern institutions of teacher education offer one or more courses in philosophy of education. Slightly more than half these courses are entitled "Philosophy of Education," while the remaining ones are about equally divided between "History and Philosophy of Education" and a group of thirty-four miscellaneous titles. Only one-fourth of these courses are requirements in the professional education of school personnel. The courses are offered primarily at the

junior-senior level, but in some cases they can be taken by sophomores, and in some others by graduate students.

Eight theses, each suggesting either directly or by implication certain improvements of the present philosophy of education course, were developed in this study.

1. The "incidental" approach to philosophy of education through a number of undergraduate courses has generally been a failure. In most instances teachers entering the field lack a unified, consistent point of view toward both education and life.

2. A course in philosophy of education should be required of all undergraduate teacher-education students. This course should be augmented by the various other professional education courses.

3. As has already been noted, the major aim of the philosophical course should be the development of the student's ability to philosophize.

4. At the undergraduate level the most effective approach to subject-matter is the problem-topics approach.

5. The type and amount of materials are of less importance than the use to which they are put. They should all be directed toward the stimulation and illumination of the student's interest in philosophizing.

6. All possible desirable means of student participation should be encouraged in the philosophy of education course.

7. All pertinent available evidence should be utilized in evaluating the course.

8. Instructors of philosophy of education courses should be thoroughly prepared and qualified for their work, and they should be interested primarily and professionally in the philosophical field.

On the basis of the material presented in this study, five conclusions have been drawn and seven recommendations (not detailed here) have been made:

1. Philosophy of education is at the present enjoying an unusually great amount of emphasis, and the social and scientific advancements of the twentieth century may well mean that philosophy of education will become, in the years ahead, an even more vital part of the professional education of the American teacher.

2. The historical influence of Northern and Midwestern philosophy of education courses on similar courses in the South is clear. The early instructors in the Southern institutions were generally educated at Harvard, Yale, Indiana, Columbia, or a similar university, and the courses they offered in the South were patterned after the ones they themselves had taken in the Northern schools.

3. There is at the present no consistent point of view among the 277 Southern institutions of teacher education concerning the status of philosophy of education.

4. There is likewise at the present no consistent point of view among the 163 Southern institutions of teacher education which offer philosophy of education concerning the nature of the course.

5. There appears to be a very definite lag between the curricular practices in Southern institutions of teacher education and the importance ascribed to courses in philosophy of education by instructors and administrators in the South and educational leaders throughout the nation.

Microfilm \$6.85; Xerox \$24.30. 537 pages.

THE ACADEMICALLY TALENTED PUPILS IN THE ELEMENTARY DIVISION OF THE UNIVERSITY OF MISSOURI LABORATORY SCHOOL

(L. C. Card No. Mic 59-6366)

Howard Wellington Smith, Jr., Ed.D.
University of Missouri, 1959

Supervisor: L. G. Townsend

Purpose: The purpose of this study was to discover and describe the academically talented pupils enrolled in grades one through six in the Laboratory School of the College of Education of the University of Missouri and to ascertain the activities in which the academically talented students engaged within the heterogeneous administrative organization of the institution concerned.

Method of Research: A modified case study method was employed in the development of this problem.

The study encompassed three general phases. These phases were as follows:

1. Identification of the cases.
2. Determining the characteristics of the cases.
3. Ascertaining, classifying, and appraising the instructional activities of the selected cases.

The specific research techniques used in this study included:

1. Administration of group and individual tests of intelligence.
2. Administration of achievement tests.
3. Administration of personality scales.
4. Use of selected sociometric devices.
5. Interview schedules.
6. Survey of school records.
7. Measurements of physiological development.
8. Time sample observation of instructional activities.

Summary:

Twenty-three cases, twelve boys and eleven girls, were identified as academically talented students. These twenty-three cases represented approximately 15 percent of the total school population in grades one through six. More than half of the cases were enrolled in grades four and five.

An intensive investigation of characteristics of the pupils revealed that:

1. A range of forty-five points existed in Stanford-Binet I.Q. scores despite the minimum limitation of an I.Q. of 140, or above.
2. Academic achievement was accelerated in all measured areas.
3. Academically talented pupils enjoyed equal social recognition with control pupils in out of school activities and decided superiority in peer acceptance in school activities.

4. Academically talented pupils achieved higher adjustment ratings than control pupils.
5. Socio-economic background was superior, but not in variance with control cases from the same school population.
6. Interest patterns were distinctively individual and gave evidence of a considerable degree of variety.
7. School activities of the academically talented pupils were those generally characterized as desirable enrichment practices.
8. As a group, the academically talented pupils were achieving at a level commensurate with their abilities.
9. Individual differences were apparent in every characteristic of growth and development.

Conclusions:

1. Individual differences in mental ability, academic achievement, or social and emotional development of academically talented pupils would not have been eliminated by ability classification or grouping.
2. Academically talented pupils differed from pupils of similar chronological ages principally in characteristics related to mental ability and academic achievement.
3. The academic, social, and emotional needs of academically talented pupils could be met by activities comparable to those provided by the Elementary Division of the University of Missouri Laboratory School.
4. There were no discernable differences between the kinds of educational activities of the academically talented pupils and the kinds of educational activities of other pupils.

Microfilm \$3.85; Xerox \$13.50. 300 pages.

A STUDY OF THE HIGH SCHOOL PRINCIPALSHIP IN KENTUCKY

(L. C. Card No. Mic 60-704)

Harry Magee Sparks, Ed.D.
University of Kentucky, 1955

Supervisor: Dr. Frank G. Dickey

STATEMENT OF THE PROBLEM

This is an investigation of the principals in the State of Kentucky who administer schools offering a terminal program through grade twelve. There is a need for a clearer understanding of this administrator's role in the total instructional program and for identification of the problems which hamper his proper function as an educational leader.

The purpose of the study is to provide impetus toward further professionalization of the principalship through suggesting more effective procedures for pre-service

education, certification, and in-service improvement of Kentucky's secondary principals.

THE PROCEDURE

The sources of information were 394 questionnaires returned from the 543 Kentucky high school principals, the State Department of Education files, and literature on secondary school administration.

A modern concept of the secondary principalship was developed and the personal and professional background, duties, and beliefs of the principals were analyzed. Comparisons were made of principals on the basis of the four types of high schools administered, enrollments, and whether or not the school administered held membership in the Southern Association of Colleges and Secondary Schools.

FINDINGS

It was found that Kentucky's typical secondary principal is a man, forty-four years old, born in the state and reared on a farm, is married, has two children, and is an active church member. He has worked on a farm, in industry, or in the armed services. He reads the *Courier Journal*, a local newspaper, the *Readers Digest*, a pictorial magazine, a weekly news magazine, and one general magazine.

The typical principal holds a master's degree, an undergraduate major in English or one of the social studies, has taught for twelve years, and entered the principalship from a teaching position. He has been in his present job for seven years and works for twelve months at a salary of \$3,689.19. He has taken twenty-six semester hours of graduate work since becoming a principal, fifteen of which was earned in the past three years. He holds membership in the state and national general education associations but not in the principalship associations. He reads the state and national association journals but little in professional journals devoted to administration.

In the study of duties, the mean performance by the principals was in the following order or rank: clerical work, teaching, supervision, discipline, extra-curriculum, guidance, public relations and professional study. However, the order in which they believe they should spend their time was: supervision, guidance, public relations, professional study, clerical work, extra-curriculum, discipline, and teaching.

A comparison of the effective functions of the principals revealed that: those of independent district high schools held a slight advantage over principals of county, private and schools for Negroes; principals of schools with larger enrollments were consistently better; and those of Southern Association schools surpassed the principals of non-member schools.

RECOMMENDATIONS

In the light of the findings, the following program of action is recommended:

1. A selective recruitment program for secondary school principals.
2. Improvement of institutional and in-service training in the foundations, supervision, and guidance.

3. Strengthening of training in specific areas: discipline, scheduling, promotion, attendance, etc.
 4. Improved twelve-grade principal's certificate.
 5. Increased increments for in-service growth.
 6. Membership in the state and national associations for secondary school principals.
 7. An executive secretary for Kentucky's Secondary School Principals Association.
 8. A study council on problems in secondary school administration.
 9. Effective scheduling of principals' activities.
 10. Accrediting agencies require full-time school secretaries.
 11. Policies which make the assistant principalship a better training experience for the principalship.
 12. Expense allowance for travel in school area.
 13. District superintendents counsel with principals before assigning teachers.
 14. A study to determine an acceptable enrollment for Kentucky high schools and an effective principalship.
 15. Extension of membership in the Southern Association of Colleges and Secondary Schools.
- Microfilm \$3.20; Xerox \$11.25. 246 pages.

OPINIONS OF SCHOOL ADMINISTRATORS
CONCERNING SELECTED ASPECTS OF
THE PROGRAM OF VOCATIONAL AGRICULTURE
IN MISSOURI

(L. C. Card No. Mic 59-6367)

Earl Sherman Webb, Ed.D.
University of Missouri, 1959

Supervisor: Dr. G. F. Ekstrom

PURPOSE OF STUDY: The purpose of this study was to ascertain the opinions of Missouri school administrators to see if sufficient agreement existed to warrant a reconsideration of the organizational structure of the program and teacher preparation in vocational agriculture.

METHOD OF RESEARCH: Data were obtained by information forms mailed to superintendents and principals of the 266 public secondary schools of Missouri offering vocational agriculture in their school programs.

SUMMARY: A majority believed the controlling purpose should be to train for agricultural occupations and all eligible groups -- all-day students, young farmers and adults -- should be enrolled.

Respondents believed communities regard vocational agriculture as significant only for persons concerned with agriculture.

Respondents believed students enroll in vocational agriculture because they want to become farmers or are interested in occupations related to farming.

Social status of students of vocational agriculture is not lowered by enrolling in the course.

Administrators are uncertain about the need for advisory committees.

Most administrators believed students of vocational agriculture receive adequate general education.

Vocational agriculture is not justified solely on the number of former students entering farming.

More emphasis in vocational agriculture should be placed on classroom teaching, farm mechanics and farming programs of students; with less emphasis on contests and Future Farmers of America.

Most respondents believed students of vocational agriculture receive the basic preparation to enter farming.

General agriculture is not needed in most schools offering vocational agriculture.

A majority believed teachers should conduct on-farm instruction for out-of-school groups.

Development of rural leadership is believed to be a primary function of Future Farmers of America.

Activities of Future Farmers of America do not tend to create segregation among students and public relations programs are conducted with due regard for total programs of schools.

Personal qualities of teachers in need of most improvement are cooperation and grooming.

Professional qualifications most inadequate are oral and written English, student management, and house-keeping.

Less than a majority believed summer programs of teachers justify twelve months employment.

Administrators consider the work load of teachers of vocational agriculture to be less than other teachers, however their monthly salaries and extra-curricular duties should be the same.

The expense of providing vocational agriculture is believed to be justifiable but the present program would be modified in the absence of Federal funds.

Administrators believed teachers should be reimbursed for travel and other expenses incurred because of official duty.

Administrators believed schools should stock the items used most often in farm mechanics.

CONCLUSIONS: Neither school classification nor administrative position are factors in the acceptance of vocational agriculture in Missouri.

Training in vocational agriculture is believed to be vocational education.

Administrators consider high school students to be the first responsibility of teachers of vocational agriculture.

Teachers qualifying in recent years have shown improvement in their cooperative attitudes.

Restrictions imposed by the use of Federal funds hamper administrators in assigning teachers of vocational agriculture to duties believed to be in the best interest of schools.

Program planning to meet changing social and economic conditions in agriculture is needed to bring about realistic adjustments in the program of vocational agriculture.

Some teachers of vocational agriculture have not utilized their time during summer months to best advantage of the program.

Administrators determine the work load of teachers by the number of classes taught daily and the number of students enrolled in each class.

Microfilm \$4.15; Xerox \$14.65. 323 pages.

THE ASSISTANT SUPERINTENDENCY IN LOCAL SCHOOL DISTRICTS OF NEW JERSEY

(L. C. Card No. Mic 59-5330)

Norman S. Weir, Ed.D.
Rutgers University, 1959

The study proposed to examine and interpret the background, duties, and functions of the assistant superintendent of local school districts in New Jersey in the light of current concepts of school administration by ascertaining the responsibilities discharged, their frequency of performance, and their executive characteristics.

The study included forty of the forty-nine assistant superintendents who had been nominated by their superintendents and appointed by their boards of education in accordance with the laws of New Jersey governing the position. A check list was completed covering the types of responsibility discharged. Personal interviews were made with each to obtain information, reactions, and judgments that could not be obtained through the check list. A study of related literature in the areas of business, government, and educational administration was used to help interpret the data.

The assistant superintendents were experienced in education. The median number of years in school work was twenty-five. All of them had experience in the class room and the majority recommended this as basic for the position. Their immediate backgrounds included the titles of assistant principal, supervisor, director, administrative assistant, and principal. The majority came from the ranks of elementary school principals. Most of them had been previously employed in the same districts. The median numbers of years in the district was twelve and the median number of years in the position was three. The typical assistant superintendent was forty-six years old, married, male, held the master's degree plus fifty hours credit, worked in a school system of seven thousand pupils housed in twelve schools. He worked on a twelve month's basis with one month's vacation, and regarded himself as an administrator rather than a supervisor.

The most satisfactory aspects of the position were: the enlarged scope, the opportunity to work with a greater variety of problems and people; the increased status of the position, the greater freedom of movement, the opportunity to participate in formulating system-wide policy, the feeling of getting ahead, and the working as a member of the executive team. The three activities that were reported as being the most time consuming were: recruitment of teachers, curriculum evaluation and development, and in-service training. In addition to these three, the development of educational policy, the supervision of education, community participation, and business management were rated as very important. The work of the assistant superintendents was divided among the recognized functions of executive action such as establishing policy, making, or helping to make, decisions that affected the

entire system; coordinating the various agencies and departments; maintaining organization-staffing; delegating responsibility to subordinates; setting objectives, usually as a member of the executive team; exercising judgment; dealing with the public, and budgeting and finance.

The major recommendations were: that the superintendent and his assistant take the lead in defining the duties and authority of the assistant superintendent in light of the needs and structure of the local district, that channels of communication be established so that a two way flow, vertical and horizontal, of information and ideas pertinent to the operation of the school system be made effective, that the role of a new assistant superintendent be studied carefully by those responsible for his appointment and by the candidates for the position, that the assistant superintendent have a voice in the formulation of educational policy, and that graduate work in the coordination and articulation of school systems, techniques of group dynamics, public relations, team administration, and organizational communications be obtained by those interested in the assistant superintendency.

Microfilm \$3.10; Xerox \$10.80. 239 pages.

AN ANALYSIS OF LEADERSHIP PREPARATION AS IT RELATES TO EDUCATIONAL ADMINISTRATORS

(L. C. Card No. Mic 60-719)

Ollie James Wilson, Ed.D.
University of Kentucky, 1951

The Problem

This study seeks to determine what educational administrators should acquire through a program specifically concerned with the preparation of administrative leaders. Interest in the training of school administrators has become rather widespread during the past decade. The feeling of educators and laymen alike is that American public education needs dynamic, capable leadership, and that the functions of school administration are so complex that specialized training is needed beyond the preparatory program normally required of teachers. This study, therefore, inquires into the specific items in which the school administrator should become proficient.

Purpose

This study seeks to determine the specific skills and competences which the educational administrator should acquire through a leadership training program in order to prepare him for leadership in the school and community.

Findings

1. Considerable interest in a new type of training for educational administrators was found in the expressions of contemporary writers through books, periodicals and reports.
2. Contemporary writers were found to have listed thirty-four broad areas in which skills and competence should be developed and to have indicated 126 items which they regarded as skills. These, however, proved to be combinations of two or more skills rather than one specific skill.

3. The reaction of 187 respondents to a questionnaire resulted in the compilation of sixty-five items which respondents regarded as "skills and competence."

4. Notwithstanding the interest shown by respondents in training for administrative leadership, it is apparent that their understanding of what should be included in a leadership training program has not kept pace with their interest.

5. It is apparent that respondents have not distinguished between areas, skills, and competences.

6. A comparison of responses from localities of 100,000 or more to those of less than 100,000 indicates the training of educational administrators should be essentially the same for large and small systems.

7. It appears that a recognition of the essential areas in which educational administrators should be trained comes with experience.

8. No significant variation in the need for leadership training among the state represented in this study was indicated.

Implications

1. Due to the fact that both educators and laymen have a limited concept of what leadership training should be, the writer feels it would be inopportune to discard the "old" at this time. The adoption of a "new" concept in leadership training should be gradual and come only after careful research.

2. A vast amount of research, followed by an extensive public relations job, is needed before deciding what changes should be made in the present program for preparing school administrators.

3. Institutional progress should be reappraised in the light of this study and such modifications in the course offerings made as to insure coverage of the areas indicated as essential.

4. In order to train prospective administrators in the numerous areas indicated by this study, it seems that both the graduate and the undergraduate programs will have to be geared to leadership training.

5. Due to the nature of many areas indicated in this study, education faculties alone will be unable to conduct the whole leadership program. There will, therefore, have to be close coordination with other programs within each college or university.

6. There should be considerable flexibility in the leadership program so that the individual will not be subjected to a "straight-jacket" type of curriculum.

7. Because many of the areas indicated in this study do not lend themselves particularly well to the classroom situation, greater resourcefulness on the part of faculty members will be required in planning the desired learning experiences.

8. Even if it were feasible from the standpoint of time to break down administrative functions into minute details, the writer suggests that such a process would be incompatible with the organismic or Gestalt theory of learning by the whole rather than by parts.

Microfilm \$2.50; Xerox \$7.80. 106 pages.

OSCAR HENRY COOPER: MASTER BUILDER IN TEXAS EDUCATION.

(L. C. Card No. Mic 59-6739)

Ralph Taylor Wootton, Ed.D.
The University of Texas, 1959

Supervisor: Dr. C. C. Colvert

Oscar Henry Cooper, acclaimed the "Father of Texas Schools," was unquestionably a master builder in the educational program of his native state. In the variety of activities, in the length of service, in the distinctive fruitfulness of his contribution, and in his scholarship, he attained respected excellence. His activities extended to both denominational and to public education. For almost sixty years he had a vital function in every great forward movement for education in the state.

Cooper was born in Panola County, Texas, in 1852. He received a quality elementary training and then attended Marshall University. From there he went to Yale where he graduated with superior recognition. Later, after serving as president of Henderson Male and Female College, he taught in the Sam Houston Normal Institute, in Yale University, and studied in Germany.

The educator was State Superintendent of Public Instruction from 1886 to 1890. The following years were devoted to the superintendency of the Galveston public schools. From 1899 to 1902, he was president of Baylor University, and from 1902 to 1909, the Nestor of Texas education was president of Simmons College. His administration at both Baylor and Simmons was profoundly significant; he gave those institutions a new standard and a stimulus for scholarly achievement.

His greatest services were in the area of public education. To Cooper is credited the authorship of the bill for establishing The University of Texas for which he campaigned vigorously. He was one of the founders of the Texas State Teachers Association. As Superintendent of Public Instruction, Cooper laid the foundation for county supervision, uniform textbooks, high schools, and many other constructive movements. He was active in the Conference for Education in Texas and in the State Educational Survey. He was honored with the LL.D. by the University of Nashville in 1891, and by Baylor University in 1914, and with the Litt.D. by Simmons University in 1925.

Microfilm \$4.10; Xerox \$14.40. 320 pages.

THE RELATIONSHIP OF INITIAL COST AND MAINTENANCE COST IN ELEMENTARY SCHOOL BUILDINGS

(L. C. Card No. Mic 59-6878)

William Jerome Zimmerman, Ed.D.
Stanford University, 1959

A survey of the literature on school planning reveals a sustained interest in the relationship of initial cost of school construction to subsequent maintenance costs. An inverse relationship is generally assumed, but empirical evidence to support the assumption is lacking. Authorities in the field frequently express concern for the lack of

actual research in this area. This study was designed to determine the relationship between initial cost and maintenance cost and to analyze the effect of variables significantly related to initial cost and maintenance cost.

In order to obtain consistent records and a comparable maintenance policy, the study was limited to twenty elementary schools in the Los Angeles City School District. Schools built between July, 1948 and December, 1951 were selected. Actual costs of construction of these schools were obtained. Costs of excavation, temporary buildings, architect's fees, and all development outside building lines were excluded in order to arrive at a net cost figure for each permanent building. A construction cost index was used to adjust for differences in cost due to the date of construction. Maintenance costs for repair of building and fixed equipment were obtained, by school, for the fiscal years 1953-1957. An estimate of the amount of maintenance allocable to temporary buildings at each school was made and excluded from the maintenance cost of the school. The units used for comparison were initial cost per square foot and mean yearly maintenance cost per square foot.

Five variables were found to be significantly related to initial cost scores; two others were found to be significantly related to both initial cost and maintenance cost scores. No variables were encountered which were related only to maintenance cost scores.

The hypothesis that no relationship exists between initial cost and maintenance cost was tested by analysis of variance. The null hypothesis was rejected when the F ratio was found to be significant at the .05 level of confidence on the two-tail test.

The product-moment correlation, calculated to determine the extent of the relationship between initial cost and maintenance cost z scores, was found to be -0.46 with a standard error of .219, indicating a substantial inverse relationship. This correlation is judged to be a low estimate of a relationship that would be revealed if all factors could be held constant.

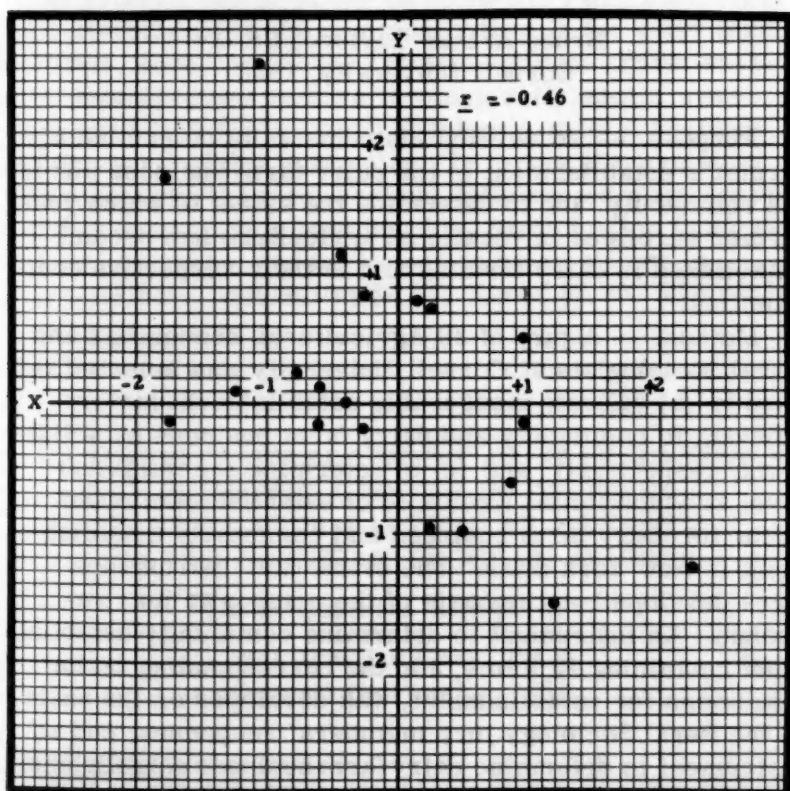


Fig. 1. -- Scattergram of initial cost and maintenance z scores.

The z scores of initial cost (X axis) and maintenance cost (Y axis), plotted in Figure 1, reveal that the inverse relationship is also linear. Again using z scores, the regression equation is $Y' = -0.46X$, and the standard error of the estimate is .89 (see Figure 2).

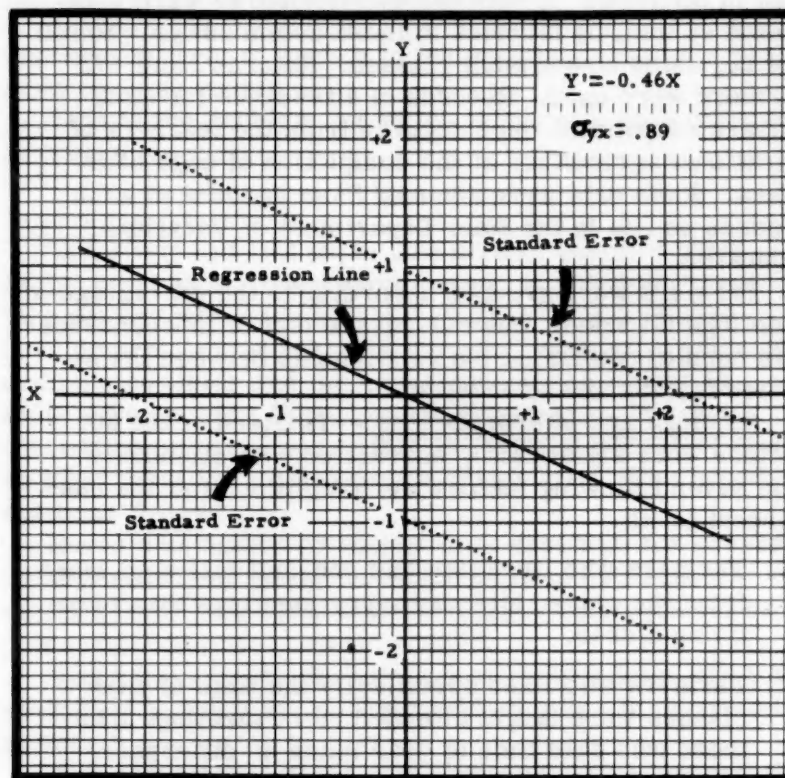


Fig. 2. -- Regression of maintenance cost z scores on initial cost z scores.

Although highly accurate predictions of maintenance cost scores of individual schools can not be made from the regression line, the best possible predictions will fall on this line. However, the main value of the regression line is not the accurate prediction of maintenance cost scores from initial cost scores; rather, it is as a conservative graphic representation of the relationship of initial cost and maintenance cost scores. The study supports the generalization that the higher the initial cost the lower the maintenance cost; and, conversely, the lower the initial cost the higher the maintenance cost.

Microfilm \$2.50; Xerox \$5.40. 108 pages.

EDUCATION, ADULT

SELECTED FACTORS ASSOCIATED WITH ATTENDANCE AT ADULT FARMER CLASSES IN MICHIGAN

(L. C. Card No. Mic 60-546)

Philip Barr Davis, Ph.D.
Michigan State University, 1959

Major Professor: Dr. H. P. Sweany

Purpose. -- The purpose of this investigation was to study specific data which reveal the association between attendance at adult farmer classes and selected factors related to the farmers or their classes.

Method. -- A review of literature helped identify some of the factors used in this study. Teacher trainers and teachers of adult farmers suggested others. A questionnaire consisting of 30 factors was administered to farmers attending adult classes in 39 randomly selected communities in Michigan. Additional questionnaires were completed by mail by farmers in these communities who did not regularly attend adult classes. Returns from 472 farmers were used. Records of attendance for each farmer respondent were secured from the teachers of vocational agriculture at the completion of each adult class. Some data were secured from records of adult classes on file in the State Department of Vocational Education.

Farmers were grouped according to the percentage of meetings attended. The chi-square test of independence was used to determine the relationship between the selected factors and attendance.

Findings and Interpretations. -- Thirteen of the 30 factors were significantly associated with attendance. The seven following factors were significant at the one percent level:

1. Farmers who lived five and one-half miles or more from the center attended more meetings than those living closer.
2. Farmers who liked specifically the time of year classes were taught attended more meetings than those who said time of year made no difference.
3. Farmers, who felt the method used in classes made them want to attend, did attend more classes than those who thought methods used had no influence on their attendance.
4. Class meetings that covered farmers' problems caused those who appreciated this practice to attend more meetings than those not influenced by this practice.
5. Farmers, who preferred the time of day classes were held, attended more meetings than those who said the time of day made no difference.
6. Class meetings held less than 20 weeks in length were attended more regularly than those classes held over 20 weeks.
7. Dairying and Soils-Landscaping classes were attended more regularly than those in Livestock Production.

The six following factors were significant at the five percent level:

8. Farmers who favored discussing their problems in class had better attendance than those who indicated this factor had no influence on their attendance.
9. Farmers indicating that attendance in previous years made them want to attend, had better attendance than those who said it made no difference.
10. Farmers who said the agricultural teacher's ability made them want to attend had better attendance than those who said it had no influence.
11. Farmers who said the agricultural teacher's personality made them want to attend had better attendance than those who said it had no influence.

12. Poultry farmers, dairymen, and general farmers had more regular attendance than other types of farmers; non-farmers had the poorest attendance.
13. Farmers preferring "car-pools" had better attendance than those who said it had no influence.

Similar studies are recommended in other states to verify further the findings or to identify other significant factors.

State educational leaders in recognizing the importance of attendance should capitalize on the findings of this study in working with teachers of vocational agriculture to promote adult education in agriculture.

Because attendance tended to decrease where classes were held for more than 12 scheduled meetings or were continued for more than 20 weeks, state leaders should study carefully these findings to determine what practices should be recommended.

In communities where successful teachers of adults are assigned non-vocational secondary school responsibilities rather than adult farmer classes, state leaders should encourage their assignment in adult farmer education.

To encourage regular attendance, teachers of vocational agriculture should deal with problems of adult farmers and utilize discussion methods of instruction.

Teachers of vocational agriculture should assist farmers in pooling rides to adult classes and encourage attendance from year to year.

Microfilm \$2.50; Xerox \$7.60. 164 pages.

FACTORS ASSOCIATED WITH THE ESTABLISHMENT OF A DAIRY FARMER IN FARMING AND IN HIS COMMUNITY IN NEW YORK STATE

(L. C. Card No. Mic 60-604)

Bruce Arthur Gaylord, Ed.D.
Cornell University, 1959

Purpose. -- To develop instruments to determine a farmer's establishment in the dairy farm business and in his community, and to determine the extent to which young farmer enrollees in vocational agriculture had become established in dairy farming and in their respective communities.

Method. -- A jury of 30 Agricultural Economists and Rural Sociologists at Cornell University was selected and used to (a) validate measurable establishment factors relevant to community and dairy farm business establishment, respectively, and (b) to determine the minimum level at which initial likelihood of establishment could occur for dairy farm business and community establishment in New York State. The evaluation instruments were developed on the basis of the composite jury response. An instrument to determine community establishment containing 13 items, and the corresponding factor minimums for establishment, was developed on the basis of the Rural Sociology jury members' responses, and an instrument to determine dairy farm business establishment containing 15 items was developed, with the accompanying

minimum levels for establishment, on the basis of the Agricultural Economics jury members' responses.

Data were secured by questionnaires and personal interviews from the 77 young farmer enrollees who were (a) currently enrolled in a young farmer program in a school cooperating as a student teaching center, (b) in the age bracket of 21-35 years inclusively, and (c) associated with a farm business with 12 or more dairy cows.

Findings. -- With respect to establishment in the community, the following was revealed: six of the 77 young farmers had achieved community establishment status, seven of the young farmers were deficient in the attainment of one factor minimum, eight were deficient in the achievement of two factors, twenty-five were deficient in three factors, sixteen young farmers were lacking in four establishment factors, and eight were non-attainers of five factors. Three men were deficient in six factors, two were lacking in seven factors, and two others had not attained the minimums necessary for establishment status for eight of the community establishment factors. A mean of 3.52 factor deficiencies was computed for the 71 young farmers who had not attained community establishment status.

In terms of establishment status in the dairy farm business, two young farmers were found to be successfully established. Five young dairymen were deficient in one factor of farm business establishment, thirteen men were deficient in two factors, sixteen young farmers were lacking in the attainment of three factors, and six of the 77 young men had not achieved the necessary minimums for four factors. Thirteen dairymen failed to attain five farm business factor minimums, four were deficient in six factors, ten were deficient in seven factors, five were lacking in eight factors, two had failed to attain nine factors, and one young farmer had not met ten factor minimums for establishment status recognition. A mean of 4.40 deficient factors was calculated for the 75 young farmers who had yet to attain farm business establishment status.

In general, the 77 young farmers were more successfully established in the community than in the dairy farm business, according to the criteria applied. Farm business establishment factors in which deficiencies were most prevalent were: labor efficiency, size of business, and amassed equity in farming. In terms of community establishment, the most serious deficiencies were registered in organization membership, participation in agricultural agencies, and participation as an officer in organizations. Microfilm \$2.85; Xerox \$9.90. 219 pages.

COMMUNITY DEVELOPMENT AS PREPARATION FOR ECONOMIC GROWTH IN DEVELOPING COUNTRIES WITH PARTICULAR REFERENCE TO THE SAKTIGAR PROGRAM IN INDIA

(L. C. Card No. Mic 60-608)

Jack Douglas Gray, Ed.D.
Cornell University, 1959

The Problem

How to get economic growth started in the developing countries of the world is the problem taken up for study in

this paper. Programs of economic and technical assistance to the under developed countries have grown in number and scope since World War II. In spite of all this assistance and in spite of corresponding efforts on the part of the countries concerned, self-sustaining economic growth has failed to get started in a majority of the under developed countries. What will be necessary to inject the dynamic element of growth in the relatively static economies of these countries?

This is the problem for which this study undertakes to develop a solution.

Procedure

The study and this paper are divided into two parts. In the First Part, based upon a study of available literature dealing with economic development, agricultural development, community development, extension education and related fields and the experience of the writer in India's Community Development Program, a detailed discussion and analysis of this problem is presented and an hypothesis for its solution is formulated. The hypothesis is as follows:

Rural community development is essential for providing a preparatory phase in the process of getting economic growth started in less-developed countries where democratic methods are to be used.

The "preparatory phase" is then broken down into its components which are called "prerequisites for economic growth."

The second part of the paper presents a rather detailed case study of Saktigar Community Development Program in India, aimed at determining whether the program actually established the prerequisites for economic growth.

Conclusion

The results of three years of community development in the villages of Saktigar seem to support the hypothesis in every respect. Therefore, the conclusion is that rural community development, if fully applied, can prepare the ground for economic growth in less-developed countries and, where democratic methods are to be used, it is essential to the success of economic development programs.

Microfilm \$5.35; Xerox \$18.90. 417 pages.

SELECTING THE ADULT EDUCATOR

(L. C. Card No. Mic 59-6240)

Daniel J. Healy, Ph.D.
New York University, 1959

Chairman: John Carr Duff

The purpose of the study was (1) to identify criteria used by directors of public school adult education programs in the selection of adult education teachers for four general areas of instruction (vocational, avocational, cultural, and academic); (2) to validate specific criteria of selection and (3) to test these specific criteria. The thesis reviews some of the factors in the recent development of Nassau County and offers descriptive information concerning the nature and scope of public school adult education in the County during the period 1947-1957.

A questionnaire was constructed to identify those criteria of teacher selection which were most valuable in predicting classroom performance. The returned questionnaires (a 70 per cent response) were tabulated. From this tabulation a rank order scale was established.

The twenty-six highest ranking criteria were then submitted, in questionnaire form, to a jury of informed people for validation. Nine of these twenty-six criteria were considered to be valid teacher-selection criteria for public school adult education programs in the United States. The nine criteria, thus validated, were translated into descriptive statements of judgement which constituted the testing instrument. These testing instruments were sent to students enrolled in public school adult education programs in Nassau County.

Additional data on the teachers being rated were gathered in order to compare those teachers who had training as teachers of youth with those who did not.

The student responses (73 per cent return) were divided into the four general areas of instruction, each of which was then sub-divided into the two previously-stated teacher categories. In each area of instruction analyses of variance were conducted on two separate samples of the returned testing instruments. In the nine criteria of selection there were no significant differences (at the 5 per cent level) in the student ratings of the two groups of teachers in each of the four areas of instruction.

The investigator concluded that teacher certification for the teaching of youth is an indefensible criterion for the selection of public school adult education teachers.

The investigator concluded that Nassau County is approaching the end of a period of rapid growth, and that the expansion of public school adult education will continue at a reduced rate in Nassau County.

The data collected in the study indicated a wide divergence of opinion among the directors of public school adult education programs in the criteria used for selecting teachers. The investigator recommended additional research into:

1. selection practices
2. the nature of public school adult education students and program directors
3. the relationship of community structure to public school adult education
4. teacher certification practices which provide for the licensing of public school adult education teachers.

Microfilm \$2.50; Xerox \$8.20. 180 pages.

THE AGRICULTURAL EXTENSION SERVICE COMMUNITY DEVELOPMENT PROGRAM IN GEORGIA

(L. C. Card No. Mic 60-607)

Josephas Jackson Lancaster, Ed.D.
Cornell University, 1959

Purpose.

Full utilization of the Community Development Program, and Rural Community Improvement Clubs as means

and methods of Agricultural Extension teaching in Georgia awaits better understanding on the part of all concerned of the educational processes involved. The purposes of this study were to describe the Georgia Community Development Program; compare it with other type Community Development Programs, and determine some of the differences between active and inactive club communities in Georgia.

Procedure.

The Community Development Program in Georgia is described as being an educational process and a medium of extension teaching. Program organizations and functions at state, area, county, and community levels are discussed and some results of community improvement club activities are indicated.

The program as described for Georgia is compared with programs in the "community organization" concept, the "community development" concept, and similar extension programs in other Southeastern states.

The determination of differences between active and inactive community improvement clubs in Georgia was based on a survey of recognized leaders in sixteen rural communities in the Atlanta and Chattanooga program areas. Active clubs were defined as being currently active and had been organized for at least 3 years. Inactive clubs were defined as having been organized within the last 10 years but had ceased to be active.

Results.

The Georgia program was found to differ from other type programs in several respects. The chief difference between the Georgia program and programs in other Southeastern states appeared to be in the areas of sponsorship and awards schemes.

Results of the survey indicate a number of differences between active and inactive clubs:

1. Characteristics of leaders.

Leaders in active clubs were younger, more likely to have children in their families and had attained somewhat higher levels of educational achievement than leaders in inactive club communities. Also a greater proportion of the active club leaders were male and had, on the average, a shorter period of residence in the community.

2. Characteristics of communities.

Communities having active clubs tended to be somewhat larger in terms of the numbers of families living within their boundaries than did inactive club communities. They also appeared to have on the average more adequate community facilities and services.

3. Characteristics of clubs.

Active clubs appeared to be more efficient in their organizational functions than did those that had ceased to be active. They also utilized a greater number of committees in their project activities and worked on a greater and more widely diversified range of projects. They likewise appeared to have somewhat better planned and more widely publicized meeting programs, and utilized the services of more outside agencies and organizations than did inactive clubs.

Implications.

In the interest of maintaining continuously active community improvement clubs as mediums of extension teaching, local extension workers will likely find the encouragement of local organizations more nearly in conformity with the characteristics described for active clubs in this study to be a profitable practice. Other implications of the study indicate that the addition of certain educational and social subjects to the curricula for training agricultural extension workers would be desirable.

Microfilm \$2.50; Xerox \$8.20. 176 pages.

**A METHOD FOR DETERMINING THE
STANDARD ERROR OF RATING AND
STANDARD ERROR OF MEASUREMENT FROM
A SINGLE ADMINISTRATION OF A SUBJECTIVE
ACHIEVEMENT EXAMINATION**

(L. C. Card No. Mic 59-2681)

John Paul McGuire, Ed.D.
Syracuse University, 1959

A new procedure of score analysis was developed in this study for use in determining the reliability of rating for subjective type examinations. This procedure, termed the "variance of differences method," permits a standard error of rating to be obtained for each of the several raters involved and, in addition, provides a standard error of measurement for the content included in the essay test. These indexes can be obtained after a single administration of the test by simply computing the variance of the differences between the scores assigned to each pupil by two raters and between the scores that each of two raters assigns to each half of the test for each pupil. This leads to three equations which can be solved simultaneously for the standard error of measurement of the test and the standard error of rating for each rater. This procedure involves somewhat less rigid assumptions than do other approaches to the problem. Specifically, in the variance of differences method it is not necessary to assume that the raters involved are equally reliable in respect to rating.

An empirical demonstration of this method was provided by analysing the ratings assigned to four New York State Regents Examinations in Citizenship Education. Fourteen different raters participated, with two raters assigned to one examination and four raters assigned to each of the remaining three examinations. These raters were all experienced teachers employed by the New York State Education Department to review the ratings assigned in local schools.

For purposes of comparison, the data were analysed by the variance of differences method and by two other methods. The L_1 test of homogeneity of variance was used to test the major null hypotheses in this study. The null hypothesis states that there is no significant difference between the standard errors obtained by the variance of differences method and:

1. a method based on intercorrelations.
2. a method based on analysis of variance.

For all four examinations, the hypotheses for the standard errors of rating were not rejected at the .05 level. For two of the examinations the hypotheses for the standard error of measurement were not rejected at the .05 level; for the other two examinations the hypotheses were not rejected at the .01 level.

The results of the L_1 test indicate that the indexes obtained from the newly developed variance of differences method are substantially the same as those obtained by other methods involving more restrictive assumptions and more complicated computational procedures.

Information derived from the empirical demonstration indicated that the reliability of the rating of these samples of Regents Examination papers in Citizenship Education was not high enough to substantiate the traditional practice of changing any local Regents mark that differs by more than three points from the mark assigned by the reviewing rater. It appeared that the differences between scores assigned by two raters had to be about twice that margin before the differences could be considered to be statistically significant at the .05 level.

The general conclusion based on theoretical arguments and an empirical demonstration is that the method developed in this study for determining the standard error of rating and standard error of measurement is consistent with existing test score theory and is more suitable for general use than methods requiring more rigid assumptions. In addition, this method provides individual rather than composite indexes. This is of particular importance if raters differ in reliability of rating as individual estimates reveal information that may be obscured when only composite indexes are available.

Microfilm \$2.50; Xerox \$6.20. 129 pages.

**FACTORS RELATED TO THE
DEVELOPMENT OF LIBERAL ADULT EDUCATION
ACTIVITIES IN SELECTED PUBLIC SCHOOL
SYSTEMS OF NEW YORK STATE**

(L. C. Card No. Mic 58-7243)

Robert H. Snow, Ph.D.
Syracuse University, 1958

Purpose

The primary purpose of the investigation was to identify distinctive elements in the organization and administration of public school adult education programs with a relatively high degree of emphasis upon liberal studies, rather than upon specific vocational training or manual skill activities.

Definitions

Adult education courses termed liberal in the study were those classified within two categories of the New York State adult education report form:

1. General Academic Education.
2. Civic and Public Affairs Education.

The quantitative measure of adult education program size used in the study consisted of the number of 40-minute class periods of adult instruction maintained annually by a school district.

Program emphasis was measured in terms of the ratio between the number of class periods of instruction devoted to particular subject categories within the adult program and the total periods of instruction maintained.

The Research Design

The study was exploratory in nature. Paired groups of adult education programs were selected, representing extreme contrasts in program emphasis but equated on the basis of program size. The primary set of pairs consisted of programs which were high and low, respectively, in emphasis upon liberal adult education. A secondary set of pairs was established for purposes of additional control. These programs were high and low, respectively, in emphasis upon art and craft activities. The adult education programs of 20 school districts were included in each of the 4 groups.

Fifty specific elements within the organization and administration of these adult education programs were examined. Relationships between these elements and characteristic forms of program emphasis were traced. The factors which appeared to be most closely associated with liberal emphasis in adult education programming were identified.

Procedures

The 1955-1956 adult education reports from all school districts in New York State (exclusive of New York City) which maintained adult programs during that year were reviewed. Measures of total program size and of program emphasis were computed for each district.

The paired groups of adult education programs to be studied were selected through the process of matching programs within size intervals and then drawing from extremes of distributions based upon program emphasis. All programs selected for study were drawn from those which included more than 2,000 periods of instruction during 1955-1956 and were therefore within the upper 28 percent of all school districts of New York State in terms of total adult education program size.

Consistency of program size and program emphasis during successive years was subsequently tested by examining 1956-1957 reports from the school districts represented within the sample groups and comparing programs of each district. Substantial evidence of program consistency during the 2-year period was established.

Certain items pertinent to the study which were available from official records and reports were then tabulated for each of the adult education programs under study.

A questionnaire was devised to secure additional information from directors of adult education in the school districts represented by the sample programs. Completed questionnaires were returned from all of the school districts.

An interview outline was developed and used in conducting interviews with directors of adult education in all of the school districts represented.

The data assembled by these various methods were

tabulated and analyzed. Differences observed among the paired groups with respect to the factors under study were tested for significance by chi square and *t*-test.

Major Findings

Evidence obtained during the study strongly indicated a positive relationship between liberal emphasis in adult education programming and the following factors:

1. The wealth of a school district, in terms of true value of taxable real property.
2. The amount of money expended per day-school pupil enrolled in the district.
3. The rate of pay for teachers of adult classes.
4. The degree of administrative flexibility demonstrated in scheduling adult education classes.
5. The practice of maintaining cooperative relationships with other community agencies in conducting adult education activities.
6. The extent to which professional judgment was reflected in decisions regarding courses to be included in the adult education program.
7. The amount of administrative time allotted to adult education.
8. The adequacy of secretarial services for adult education.

The findings gave some indication of a positive relationship between liberal emphasis in adult education programming and the following factors.

1. Size of school district, in terms of pupils enrolled in day-school.
2. Location of the school district adjacent to a relatively large population center.
3. Educational level of adults residing in the school district.
4. Liberal orientation in the undergraduate training and the graduate specialization of the director of adult education.
5. The tendency of the director to affiliate with national adult education associations.
6. The practice of employing part-time adult education teachers who were not members of a day-school staff; the tendency to secure teachers from colleges and social agencies, and to require extensive qualifications of teachers.
7. The practice of forming advisory committees which included a high proportion of college graduates, with members selected primarily on the basis of their status in the community.
8. The tendency, on the part of school officials, to emphasize counseling services for adult students.
9. Confidence, on the part of the director of adult education, that Board of Education members were genuinely interested in maintaining adult services.
10. The tendency of the director of adult education to

regard "new course development" as an important area of responsibility.

Findings with respect to a number of other factors considered were inconclusive.

Microfilm \$3.00; Xerox \$10.20. 229 pages.

DIFFERENTIAL ROLES OF THE PRESS AND THE RADIO IN AN EXTENSION PROGRAM IN THE UNION OF SOUTH AFRICA

(L. C. Card No. Mic 60-601)

Marthinus Luther van As, Ph.D.
Cornell University, 1959

The purpose of the study was to determine differential roles of the press and the radio in farmers' rates of adopting new farm practices in South Africa. A study was only made of the role of the press in the jointed cactus control program. This program asked farmers to use 2,4,5-T, issued free of charge by the Department of Agriculture, against the weed.

Of 569 mailed questionnaires, 280 were returned by farmers in four of the eight most severely infested districts.

Three major mass media were studied: newspapers, farm magazines, and the radio. Ninety-three per cent of the sample farmers owned radios, 91 per cent subscribed to at least one newspaper, and 90 per cent subscribed to at least one farm magazine. On the average, the farmers subscribed to as many farm magazines as they took newspapers.

Daily and weekly newspaper and farm magazine reading and radio listening patterns were analyzed, and a comparison made with similar studies in Wisconsin. From this it was concluded that the group of South African farmers read as much in newspapers as the American farm group, more in farm magazines, but listened for shorter periods daily to the radio.

The farm incomes, size of farm operations, capital outlay in farm enterprises, number of years of formal education, and the degree of social participation all showed significant differences at the 1 per cent level with both newspaper and farm magazine subscriptions and the amount of reading time expended on each (with the exception of newspaper reading time and the degree of social participation; this relationship was significant at the 5 per cent level).

All these factors also showed significant differences at the 1 per cent level with differences in radio station preferences, which were measured in three categories: those with no radios (thus preferring no radio listening), those who listened mostly or equally well to commercial and non-commercial stations, and those who listened mostly to non-commercial stations. These factors did not show any significant difference with differences in the amount of radio listening or informational radio listening time of farmers.

Afrikaans speaking farmers read significantly more in farm magazines than English speaking farmers, and listened significantly less to commercial radio stations than English speaking farmers.

From the analyses and discussion of literature it was concluded that reading patterns are to a greater degree a function of the socio-economic and cultural status of farmers than radio listening.

In the second part of the study the effects of the usage of the press and radio were studied in the jointed cactus program. The farmers received information on the program through a mean number of 4.2 different channels. Government officials reached the largest number of farmers and posters the least. Of the three mass media, newspapers reached the largest percentage of farmers (57%), followed by the radio (48%). When the effectiveness of these media were measured in terms of reading and radio listening time per farmer reached, the ratio was most efficient for farm magazines, followed by newspapers.

The analysis of the channel roles in three major stages of adoption (awareness, decision-making, and action) revealed that the "mass media" were most effective in the first stage, but rapidly disappeared as a factor in the two subsequent stages. Government agents, an important factor in the first stage, rapidly increased their importance (to the first place) in the subsequent stages. "Other farmers," an important channel in the first stage, disappeared in the two subsequent stages.

No relationships were found between farmers' general use of the three "mass media" and rates of adopting the new practice, although significant relationships were found between rates of adoption and the number of channels through which information was received.

From the analyses it was concluded that the "mass media" played their most important role, according to their primary functions, in the dissemination of first knowledge, but that these media were no direct motivating factor in bringing farmers to action on the new practice.

Microfilm \$3.10; Xerox \$10.80. 239 pages.

EDUCATION, HISTORY

ORIGIN, DEVELOPMENT AND WORK OF THE AMERICAN VOCATIONAL ASSOCIATION

(L. C. Card No. Mic 59-6350)

Carl Ray Bartel, Ed.D.
University of Missouri, 1959

Supervisor: H. H. London

PURPOSE: To trace the historical development of the American Vocational Association from 1906 to 1959, to record the major details of the origin and to describe the work of the Association in the promotion of practical arts and vocational education.

METHOD OF RESEARCH: Data were obtained from the proceedings of conventions, reports of committees, minutes of business and executive meetings and official publications of the American Vocational Association and its parent organizations, and pertinent texts, periodicals and bulletins.

SUMMARY: The National Society for the Promotion of Industrial Education was formed at New York City on November 16, 1906. It grew in membership, financial resources and prestige, held conventions, produced publications, conducted studies and surveys and actively engaged in legislative activities.

On February 23, 1918, the Society was reorganized, forming the National Society for Vocational Education. Its membership and financial resources declined from the beginning. It held conventions, produced publications, conducted studies and endorsed legislative measures.

The Vocational Education Association of the Middle West was organized at Chicago on January 16, 1914. It held conventions, produced publications and grew in prestige.

The National Society took the initial step to form the American Vocational Association on December 4, 1925, and the Middle West Association took the final step on March 20, 1926.

The American Vocational Association grew in membership, financial resources and prestige. Its Washington office was established and the first executive secretary was employed in 1934.

The Association produced publications, including a house organ, after 1926, increased its services to members and non-members, cooperated with other national organizations, and actively sponsored legislation concerning vocational education.

The Association was incorporated in 1929. Provisions have been made for practical arts and vocational education divisions, affiliated state and national associations and governing bodies. Its first constitution was adopted in 1925 and a revised constitution in 1948. Amendments were made to each constitution, the most recent one in 1957.

CONCLUSIONS: The National Society for the Promotion of Industrial Education was operated largely in the interests of and dominated by the employer group. It was a leading force in shaping the contents of the Smith-Hughes Act and in its final passage.

The Society's name was changed to the National Society for Vocational Education due largely to the passage of the Smith-Hughes Law. The new Society did not enjoy the support and prestige of the former Society.

The Middle West Association was not organized to compete with the National Society, its purposes were educational in nature.

The Middle West Association would have probably remained a regional Association had not the National Society promoted the amalgamation. The National Society would have probably affiliated with the National Education Association had not the amalgamation taken place.

The rapid growth of the American Vocational Association indicates that there was a renewed interest in vocational education. Through the years it has been largely operated by practical arts and vocational education interests of the East and Middle West, although, much of the membership has been in the South.

The Association enjoys prestige among educational and non-education organizations. It has been the organizing and driving force behind the vocational education measures before Congress.

The Association has not secured the membership of

many reimbursable teachers, nor a great percentage of practical arts teachers. Vocational guidance personnel, in the main, have not shown a desire for membership in the Association.

The Association has become more democratic, has increased activities toward the development of practical arts and vocational education programs and has increased services to its members.

Microfilm \$7.00; Xerox \$24.75. 550 pages.

THE ORIGINS AND EARLY MUTATIONS OF JOHN DEWEY'S ETHICAL THEORY (1884-1904)

(L. C. Card No. Mic 60-322)

John Edward Blewett, S.J., Ph.D.
St. Louis University, 1959

The purpose of this dissertation is to trace the development of John Dewey's ethical theory during his two decades at the University of Michigan (1884-1894) and at the University of Chicago (1894-1904), particularly as it is reflected in Dewey's efforts to grapple with specific problems in philosophy, psychology, and education. Since other investigators have minimized the importance of Dewey's reaction against Christianity, the religion of his youth and of his early teaching years, special attention is devoted to this particular question. As guide lines for the investigation of specifically ethical concerns, the following questions are given special emphasis. How does Dewey explain moral good and moral evil? What are the criteria he proposes for distinguishing the morally good act from its contrary? How does he explain the phenomenon of obligation? What weaknesses does he claim to find in the other ethical theories he considered?

The investigation reveals that Dewey never adequately understood the relation of soul to body and that he found no reliable guidance from Hegel and the neo-Hegelians whom he admired on questions concerning the relation of God to man, the psychological origin of moral evil, and the unity of man in his ethical activity. In the early 1890's Dewey began his attack on institutional Christianity and on the type of neo-Hegelianism he had championed up to that time. Christianity he condemned as outmoded, as the defender of the "method of authority," and as anti-humanist. Neo-Hegelianism he attacked for its inability to supply practical moral criteria and for its inadequate account of the relation between absolute and finite minds. With the publication in 1894 of *The Study of Ethics: A Sylabus*, a replacement of the first ethics text he had published three years earlier, Dewey began to emphasize increasingly the social and psychological aspects of moral questions.

As an advocate of "evolutionary" and "scientific" methods in ethical study, Dewey tried to clarify from 1894 to 1904 the use of these methods, but his argumentation rested too frequently on blank assertions, a disconcerting refusal to consider counter-arguments, and a failure to identify the precise meaning of key terms. In several reviews and articles he exposed the weaknesses of neo-Kantian and intuitionist ethics, but the acuteness of his criticisms was not matched by keenness in developing a viable alternative. Owing in large measure to his

misunderstanding of moral evil, Dewey left in ambiguity his own explanation of the criteria to determine moral goodness.

It was suggested in conclusion that Dewey's criticisms of rival ethical theories were, on the whole, sound; that his stress on the importance of specific inquiries on moral questions was commendable; but that his avoidance of basic questions concerning good and evil decisively limited his effectiveness as a moral theorist.

Microfilm \$4.95; Xerox \$17.55. 388 pages.

THE COLOR LINE IN OHIO PUBLIC SCHOOLS, 1829-1890.

(L. C. Card No. Mic 60-735)

Leonard Ernest Erickson, Ph.D.
The Ohio State University, 1959

The central theme of this study is the agitation to achieve equality of educational opportunity for Negroes of nineteenth century Ohio. In developing this theme it was necessary to consider other aspects of the Negro's civil status because they were linked by the agitation with the quest for educational opportunity.

The course of this agitation for educational and related civil rights falls into two fundamental periods, which divide approximately at mid-century. During the first period the Negro was barred from the schools; during the second he attended colored schools or white schools-- if he attended any at all-- depending upon the policy of the local school board. The principal champions of Negro rights during this first period were the abolitionists. Among other things, they worked for the elevation of the free Negroes in the North to refute the assertion that the Negro was a naturally inferior creature. Abolitionists established private schools for Negroes, and as opposition to the expansion of slavery grew in the forties, they were able to exert sufficient political pressure to secure admission of Negroes to the public schools and to repeal certain other civil disabilities. Following this victory a system of partially segregated schools for Negroes was established during the fifties, but such a system left much to be desired since the school boards were not required to provide education for colored children unless the enumeration of them exceeded a certain figure.

The educational discrimination suffered by Negroes in some communities whereby they were denied facilities, or had only very abridged facilities, did not tend to disappear until another civil rights victory, securing the franchise, was achieved. The Civil War broke the power of proslavery forces, and subsequent Reconstruction politics brought about the adoption of the Fourteenth and Fifteenth amendments. With these constitutional amendments the Negro achieved a new status, had the ballot, and was in a more effective position to demand equality before the law.

Before the Civil War there was no agitation for integration of the schools; indeed, it was more a matter of just having some facilities available. After 1870, however, Negroes in scattered localities called for integration, at first not because separate facilities set them aside as a class, but to remedy the inherent inadequacies of the sepa-

rate facilities. And when the school boards failed to provide relief, law suits followed, in both state and federal courts, where it was pled that such inadequacies constituted discrimination and therefore violated the Fourteenth Amendment. But they had little success with either the school boards or the courts. It was not until after more than a decade of such actions that Negroes changed their approach and finally turned to the Assembly to demand an end of the segregation law.

The event precipitating the demand for an end of the segregation law, because of the unequal provisions it made possible and because it pointed up class distinctions on the basis of race, was the ruling by the Supreme Court (1883) invalidating the Civil Rights Law of 1875. In dramatic fashion this action called the attention of Negroes to their civil position. Happily for the friends of Negro rights, by this time the white population of the state had grown accustomed to association with Negroes in politics and in other aspects of public life, and in 1887 the law providing for separate schools for Negroes was repealed with only scattered opposition. Some colored schools, however, did remain because Negroes did not protest the existence of them, or because they were located in districts where Negroes predominated.

Microfilm \$6.05; Xerox \$21.40. 475 pages.

A STUDY OF TRENDS IN JEWISH EDUCATION FOR GIRLS IN NEW YORK CITY

(L. C. Card No. Mic 59-5017)

Zevi H. Harris, Ph.D.
Yeshiva University, 1956

Adequate Jewish education for girls may well be considered one of the major problems facing Jewish educators. If American Jewish women are to create an atmosphere for their children where Jewish interests will grow, if they are to provide the inspiration necessary for the proper development of the Jewish phase of the child's personality, and if they are to concern themselves with the furtherance of Jewish cultural and educational activities, it is imperative that they be prepared -- through a proper Jewish education -- to satisfactorily fulfill their task.

This study has a five-fold purpose; to investigate the development of Jewish education for girls in New York City during the first half of the twentieth century, to determine the present status of Jewish education for girls in New York City, to examine the objectives and programs of the various schools and organizations interested in furthering Jewish education for girls, to determine the special provisions and practices relating to girls in the weekday afternoon school and the coeducational day school, and to present a comparative analysis of the objectives, curriculum, and teaching personnel of all-girl and co-educational elementary day schools. In order that the significance of changes which took place on the American scene may be more fully appreciated, the development of Jewish education for girls throughout Jewish history is briefly traced, with particular emphasis upon the European scene.

The information in this study may yield new perspectives

to Jewish educators, and may serve as a guide in determining the lines along which future educational efforts in the field of Jewish education for girls should be directed for greatest efficacy.

Jewish education for girls in New York City is the product of combined European and American influences. Favorable elements of the European Heder Metukan, of the national renaissance, and later of the day school movement for girls, were brought to this country by immigrants from Europe. These, modified and adapted to social, economic, and educational conditions in the American environment, determined the pattern of Jewish education for girls in New York City. New opportunities for Jewish education were accorded girls through the organization of all-girl schools, through the modification of boys' institutions so as to provide for girls as well, and through the formation of coeducational schools catering to girls on a par with boys.

While there has been a long struggle for the recognition of the need for giving girls a Jewish education and a subsequent laborious climb towards equal educational facilities for them, the Jewish community of New York City now offers girls opportunities for a Jewish education almost equal to those of boys. The encouraging developments in the sphere of Jewish education for girls in New York City during the first half of the twentieth century, engender confidence in a favorable outlook for the next decade. In spite of marked progress, however, the proportion of girls compared to boys receiving a Jewish education worthy of the name remains smaller than it should be. It is apparently insufficient for promotional efforts in Jewish education to merely place equal stress upon girls and boys. Past experience appears to indicate that in order to effect a change in the status quo, specific militant efforts must be directed towards encouraging the enrollment of girls. In addition, in view of the demonstrated ability of the day school -- both coeducational and all-girl -- to attract girls, Jewish educators should strive to promote this type of intensive Jewish education.

Microfilm \$4.15; Xerox \$14.65. 323 pages.

THE DEVELOPMENT OF THE ADMINISTRATIVE ORGANIZATION OF THE PUBLIC SCHOOL SYSTEM OF ALABAMA

(L. C. Card No. Mic 60-284)

Jay Emmett Thomason, Ed.D.
University of Alabama, 1959

This study traces the historical development of the administrative organization of the public school system of Alabama from 1819, when Alabama became a State, to 1935, and is chiefly confined to that phase of the system commonly called the elementary and high school grades.

In the presentation of the historical material in this study, the topical method is used. There is one chapter on each of the following topics: township and school district trustees; the State superintendency; the county superintendency; the county board of education; the State board of education; and city school systems. In the concluding chapter, a summary of the outstanding facts relative to the above topics is given in chronological order.

Since the gift of the sixteenth section lands to Alabama in 1819 was to the individual townships, the first unit of public school administration in Alabama was the township, and the first public school officials were township officials created by a State legislative Act of 1819. An Act of 1823 created school district trustees, in addition to township officials, for school districts established within the townships. Until 1854, when a State school system was created, these officials were the only public school officials in the State and had complete administrative authority relative to the public schools. After 1854, with the advent of State and county school officials, the authority of these officials gradually declined, township officials disappeared, and in 1935 district trustees served almost entirely as advisory bodies to county boards of education.

A State Superintendent of Education was created in Alabama in 1854, and, except during reconstruction when a State Board of Education existed, was the only public school official at the State level until 1919, when a State Board which has been continuous since was created. From 1854 to 1935 the power and authority of the State Superintendent gradually increased.

The office of county superintendent of education was created in 1856 and has been continuous since. The office was a part-time one in all counties until 1911, but in 1915 became a full-time office in all counties. The method of selection of this official has varied from appointment to popular election both from time to time and from county to county.

Though some county administrative body with very limited functions and authority existed in Alabama at various times after 1854, the first real county board of education came into existence in 1903. This board consisted of the county superintendent and four other members chosen by the chairmen of the district boards of school trustees. In 1915, boards of education of five members elected from each county at large were created and granted complete authority relative to the county schools. A true county unit system of schools was thus established.

Alabama had no State board of education until the Constitution of 1868 provided for a State Board with legislative as well as administrative authority in school matters. This Board was abolished in 1875. The next State Board was created by the School Code of 1919 and has been continuous since.

With the exception of Mobile, Alabama had no city school systems prior to the Civil War. During reconstruction, the State Board of Education began the practice of granting certain towns and cities local administrative control of their schools. The State legislature continued this practice after 1875, and, beginning in 1907, governed the establishment of city systems through general laws, population usually being the basic consideration. The number of city systems in the State has varied from two in 1871, to two hundred and seventy-seven in 1914, to forty-seven in 1935.

Microfilm \$4.60; Xerox \$15.40. 358 pages.

EDUCATION, PHYSICAL

INDOOR RECREATIONAL GAMES OF
FRESHMAN AND SOPHOMORE COLLEGE MEN

(L. C. Card No. Mic 59-5623)

Linus James Dowell, Ed.D.
University of Missouri, 1959

Supervisor: Ralph K. Watkins

PURPOSE: The purpose of this study was to determine the extent of claimed participation, achievement, and interest in indoor recreational games of freshman and sophomore men students at the University of Missouri and to determine relationships between participation, achievement, and interest in indoor recreational games and factors about the individuals which may influence participation, achievement, and interest.

METHOD OF RESEARCH: The basic information was collected by the survey method involving the use of information check lists to gather data on claimed student participation, knowledge, skill, where learned, and interest in indoor recreational games. Secondary information was collected from the College Aptitude Testing Office of the University of Missouri.

CONCLUSIONS: To the extent that University of Missouri students are representative of college students in general, and inasmuch as the participation, achievement, and interest in indoor games claimed by the students is a true indication of their actual participation, achievement, and interest in these games, the following conclusions seem pertinent.

- (1) Freshman and sophomore college men participate in indoor motor games and in many indoor parlor games, as well.
- (2) In general, freshman and sophomore college men participate more frequently, have a higher level of achievement and tend to be more interested in motor games than in parlor games.
- (3) It is evident that environment, experience, and mental ability tend to affect the indoor recreational games students choose to play, which in turn affects their participation, achievement, and interest in indoor recreational games.
- (4) A comparison of group A and group B students indicated that group B students, those with lower intelligence and scholastic rank, tend more toward motor games than group A students, while group A students, those with high intelligence and high scholastic rank, tend more toward parlor games than group B students.
- (5) Athletes participate more frequently, have a higher level of achievement, and in general, are more interested in indoor recreational games than are non-athletes.
- (6) A comparison of city and rural students indicated that city students tend more toward motor games than do rural students while rural students tend more toward parlor games than do city students.
- (7) Sophomores participate more frequently and have a higher level of achievement in motor games and a higher level of achievement in parlor games than do freshmen.
- (8) An apparent decline in participation in certain indoor recreational games and an increase in participation in other indoor recreational games indicates that college students are in a stage of transition with respect to certain indoor recreational games.
- (9) In relation to other games, freshman and sophomore college men participate more frequently in poker, pool, basketball, and bowling than their skills would warrant.
- (10) The indoor recreational game which appears most worthy of addition to the physical education program on the basis of this study is bowling.

RECOMMENDATIONS: On the basis of this study, it is recommended that the following indoor recreational games be considered for inclusion in college physical education and recreational programs: Badminton, Basketball, Billiards, Bowling, Bridge, Checkers, Chess, Handball, Hearts, Monopoly, Pitch, Poker, Pool, Table Tennis, Volleyball, Water Basketball, Water Polo.

It is recommended that colleges give consideration to providing facilities and equipment for free play and intramural competition in the following indoor recreational games: Badminton, Basketball, Billiards, Bowling, Checkers, Hearts, Monopoly, Pitch, Pool, Table Tennis, Volleyball.

It is further recommended that the following indoor recreational games be given consideration for inclusion in a college recreational and physical education service program for men: Bowling, Billiards, Bridge, Chess, Handball, Water Basketball, Water Polo.

Microfilm \$4.95; Xerox \$16.60. 388 pages.

THE EFFECTS OF REST AND EXERCISE ON
PERFORMANCE OF SIMPLE MENTAL TASKS

(L. C. Card No. Mic 60-391)

David Darwin Geddes, Ph.D.
University of Southern California, 1959

Chairman: Professor Metheny

The purpose of this study was to examine differences in mental and physiological responses of college men, classified according to three anxiety levels, to two tests involving simple mental tasks performed under potentially distracting conditions when either rest or exercise was interpolated between the administrations of the test.

Two parallel tests, each requiring fourteen minutes, were developed using test questions from the Wechsler-Bellevue Intelligence Test, Form 1. Test items were photographed and reduced to slides for projection and also recorded on tape for sound projection. Distracting sound effects were added to the tapes at both the question asking and response phases. Projection was synchronized with sound and the tests were played at a level of 120 decibels.

Subjects of the study were ninety college freshman men at Brigham Young University.

Data derived from the study were scores on the first and second mental tests, differences between the two mental test scores, and measures of systolic blood pressure and heart rate taken before and after each test and after three minutes of interpolated rest or exercise. In addition, relationships among mental test scores, Taylor Anxiety Index scores, and ACE scores were determined.

Findings. (1) The groups of subjects classified as ranking Low, Moderate, and High on the Taylor Anxiety Index exhibited different patterns of mental test performance. On the initial test the Moderate Anxiety Group scored significantly higher than either the Low or High Anxiety groups. On the second test the Low Anxiety Group mean score was increased three points, and the Moderate and High Anxiety groups mean scores were increased fourteen and twenty-six points, respectively. The intergroup differences were statistically significant. (2) The groups of subjects who rested between the two tests and the groups that performed three minutes of exercise before resting exhibited different patterns of mental test performance. For all Anxiety groups combined the Exercise Subjects mean score was seven points higher than the mean score of the Rest Subjects. The difference was statistically significant. The changes associated with Rest differed for the three Anxiety groups. The means of the scores were two, twelve, and eighteen points for the Low, Moderate, and High Anxiety groups. The difference between the Low and High groups was statistically significant. The changes associated with Exercise differed for the three Anxiety groups. The means of the scores were four, sixteen, and thirty-three points for the Low, Moderate, and High groups. All intergroup differences were statistically significant. Stated in terms of improvement of scores on the second test, the mean for the Low Anxiety Group of Exercise Subjects exceeded the mean for the comparable Rest Subjects by two points. For the Moderate Anxiety Group, the comparable difference was four points, and for the High, fifteen points. Only the difference between the two High Anxiety groups was statistically significant.

For the Rest Subjects the correlation between the Taylor Anxiety Index scores and amount of change between test one and test two was statistically significant ($r = .619$). For the Exercise Subjects, the similar correlation was also significant ($r = .746$). Neither the Taylor Anxiety Index nor the mental test scores were significantly correlated with ACE scores. There was no evidence of differences in patterns of cardiovascular response for the Low, Moderate, and High Anxiety groups during the experimental procedure.

Within the limits imposed by the special conditions of this study, it may be concluded that: (1) level of manifest anxiety has a significant effect on mental performance; (2) either rest or exercise interposed between two administrations of a mental performance test is effective in producing improvement in test performance, for the subjects exhibiting moderate or high levels of anxiety; (3) exercise is more effective than rest in facilitating test performance for the high anxiety group; and (4) the effects associated with exercise appear to be primarily psychological rather than physiological in nature.

Microfilm \$2.50; Xerox \$5.60. 112 pages.

AN INVESTIGATION OF THE BEARING OF MUSCULAR FITNESS UPON THE CLASSROOM EFFECTIVENESS OF ELEMENTARY SCHOOL CHILDREN

(L. C. Card No. Mic 59-2794)

Myrtie Agnes Hunt, Ed.D.
University of Maryland, 1958

Supervisor: Professor Benjamin H. Massey

Purpose

The purpose of this study was to investigate the bearing that muscular fitness has upon the classroom effectiveness of elementary children. The subjects were the fourth and fifth grade boys of the Laboratory School of the State Teachers College, Bemidji, Minnesota.

Procedure

Experimental and control groups were formed from the fourth and fifth grade boys by pairing them on the Indiana Physical Fitness scores. The experimental and control groups of each grade were treated statistically separately. The experimental period began in September 1955 and was terminated in May, 1956. In addition to the Indiana Physical Fitness Test the following tests were administered:

Grip Strength Test

The Iowa Every-Pupil Basic Skills Battery

The Ohio Recognition Scale, "Who's Who in My Group?" forms A and B

The Classroom Effectiveness Rating.

Reliability of the Indiana Physical Fitness test was established by applying the Rank Difference method of correlation between the three trial scores of each item comprising the test, while the significance of the difference between the mean scores was obtained by using the t ratio. The results of the data indicated that the reliability was sufficiently high for the purposes of the study.

At the close of the experimental period, all tests given initially were again administered, and the scores again correlated with the Indiana Physical Fitness scores. The mean scores of the initial and final tests on all variables for the experimental and control groups were statistically compared using the t ratio and the F ratio. The mean changes of the experimental and control groups on all variables in both grades were statistically compared using the t ratio and the F ratio.

Conclusions

On the basis of the data available in this study the following conclusions were drawn:

1. It was found that the muscular fitness of subjects participating in a physical education program which emphasized fitness increased statistically significantly more than did that of the subjects who participated in a program of recreational activities.
2. When muscular fitness and classroom effectiveness as measured by the Iowa Basic Skills Test, the Ohio Recognition Scale, and the Classroom Effectiveness

Rating Scale were correlated within the group at the beginning and at the end of the experimental period, a trend toward a positive relationship was found. A statistically significant correlation however, was found between muscular fitness and favorable responses of the sociometric measure, and between muscular fitness and language skills.

3. During the course of the experiment the mean changes for the experimental groups in both grades tended to be slightly higher than those of the control groups in classroom effectiveness as measured by the Iowa Basic Skills Test battery. The differences were not statistically significant at the five per cent level of probability.
4. It was found on the Ohio Recognition Scale that there were no statistically significant mean changes at the five per cent level of probability, and no trend was observable for either the experimental or the control groups.
5. On the Classroom Effectiveness Rating Scale, the experimental groups showed a statistically significantly greater mean change than did the control groups ($p = .05$).

The findings of the study were not conclusive. However, the evidence seemed to indicate that some relationship does exist between muscular fitness and classroom effectiveness. Microfilm \$2.50; Xerox \$7.80. 168 pages.

OPINIONS OF PHYSICAL EDUCATION TEACHERS IN THE PUBLIC HIGH SCHOOLS OF MISSOURI CONCERNING COEDUCATIONAL PHYSICAL EDUCATION

(L. C. Card No. Mic 59-6362)

Norman Stanley Lawnick, Ed.D.
University of Missouri, 1959

Supervisor: Ralph K. Watkins

PURPOSE: The purpose of this study was to determine the opinions of physical education teachers in the public high schools of Missouri concerning coeducational physical education. The study also attempted to determine the extent to which coeducational activities were included in the existing programs of physical education.

METHOD OF RESEARCH: The method of investigation was the survey, involving use of an opinionaire to gather data from the physical education teachers of Missouri. Usable returns were received from 988 teachers, representing 77.7 per cent of all physical education teachers in Missouri public high schools.

SUMMARY:

- (1) There is great variation in the physical education programs of the public high schools of Missouri. This study indicated great diversity in the frequency of physical education class meetings, in the length of class periods, and in the number of activities offered in the instructional program.

- (2) A definite relationship between size of the school and quality of the physical education program is indicated by this study. Larger schools have better facilities, more intramural and recreational programs, and a larger number of activities offered than do smaller schools. Teachers in larger schools have more education and more teaching experience than those in smaller schools.
- (3) Coeducational physical education is not a fad nor has it reached its maximum development. A fourth of the teachers in this study reported the inclusion of some coeducation activities in the physical education programs of their schools, and four-fifths of the teachers considered coeducational physical education acceptable.
- (4) Physical education teachers believe it desirable to provide for coeducation in some phase of the high school physical education program.
- (5) Physical education teachers believe that coeducation is desirable in both the voluntary and prescribed phases of the physical education program. The voluntary, non-credit phase of the program was indicated as the most desirable place for coeducational activities. Over half of the teachers considered coeducation acceptable in both the elective and required phases of the physical education program.
- (6) A third of the teachers reported corecreational opportunities in their schools, and a fourth of them reported coeducation activities in the instructional program of physical education.
- (7) There is a large number of physical activities suitable for coeducational instruction and participation. The most desirable of these are square dance, social dance, folk dance, table tennis, bowling, badminton, tennis, golf, and archery. Activities considered acceptable for mixed classes are volleyball, modern dance, swimming, angling, trampoline, and softball.
- (8) Most physical education teachers believe that girls who experience difficulty during their menstrual period should observe class activity in coeducational classes.
- (9) Physical education teachers believe that coeducational classes should be taught by both a man and woman whenever possible. However, there is an indication in this study that either a male or female instructor may teach a coeducational class.
- (10) The most significant factors fostering the development of coeducation in physical education are: (1) increased emphasis in education upon preparation for worthy use of leisure time; (2) increased emphasis in physical education upon social as well as physical development; (3) increased emphasis in high school physical education programs upon recreational activities; and, (4) the natural interest of boys and girls in associating with one another in informal social activities.
- (11) The most significant factors hindering the development of coeducational physical education are: (1) limitations of physical education facilities;

(2) the tradition of separating boys and girls in physical education; (3) the differences in athletic abilities of boys and girls; and (4) lack of preparation of teachers for handling coeducational classes.

Microfilm \$2.50; Xerox \$7.50. 162 pages.

**THE EFFECTS OF TWO SYSTEMS OF
WEIGHT TRAINING ON CIRCULO-RESPIRATORY
ENDURANCE AND RELATED
PHYSIOLOGICAL FACTORS**

(L. C. Card No. Mic 59-6596)

Francis J. Nagle, Ed.D.
Boston University School of Education, 1959

Statement of Problem

The major problem of this research was to determine the effects of weight training on circulo-respiratory endurance and on selected physiological factors which are indicative of circulo-respiratory efficiency, upon which endurance depends.

A second aspect of the problem was to determine whether a low repetition-high resistance weight training system was inferior or superior to a high repetition-low resistance system in its effects upon circulo-respiratory endurance and the selected factors related to circulo-respiratory endurance.

Procedure

Sixty freshmen students from the University of Florida, all eighteen to nineteen years of age, volunteered to serve as subjects in this experiment. The research was done during the spring semester of the 1957-58 school year.

The subjects were divided into three groups of twenty each. These groups were equated using body surface areas and 300-yard run times as factors.

Experimental Group LH used a low repetition-high resistance weight training system (five repetitions maximum per set) during the training period. Group HL used a high repetition-low resistance weight training system (fifteen repetitions maximum per set) during the training period. The third group, Group C, served as a control and participated in minimum physical activity courses of bait casting and archery.

During the first three weeks of the experiment an initial test was administered to the subjects which included:

A. Measurements at rest (sitting).

1. Muscle girth
2. Skinfolds
3. Muscle strength
4. Heart rate
5. Respiratory rate
6. Volume of respiration
7. Oxygen consumption
8. Volume of air inspired per inspiration
9. Ventilatory efficiency

B. Measurements during moderate exercise (peddling a bicycle ergometer at a rate of 4,275 ft. lbs. of work per minute).

1. Heart rate
2. Respiratory rate
3. Volume of respiration
4. Carbon dioxide production
5. Oxygen consumption
6. Respiratory exchange ratio
7. Volume of air inspired per inspiration
8. Ventilatory efficiency

C. Measurements during all-out exercise (peddling a bicycle ergometer at a rate of 10,026 ft. lbs. per minute).

1. Circulo-respiratory endurance (elapsed time from start of all-out exercise until heart rate reached 180 beats per minute).
2. Volume of respiration

The initial test was followed by an eight week training period. During this time Groups LH and HL followed prescribed weight training programs three times per week for one hour per training period. Groups C met classes in bait casting and archery on the same time basis.

Following the training period the final test was administered. This test included the factors previously listed.

Results

In the comparisons of the initial with the final test data on resting and exercise measurements, the results reveal no clear-cut changes in the circulo-respiratory responses of the experimental groups. In making the same comparisons on the all-out exercise time (circulo-respiratory endurance), the data shows that both experimental groups increased their mean times significantly. The mean times for the control group showed no significant change.

In the comparisons made between the groups on all the final test measurements no significant differences appear between the experimental groups on any of the factors measured.

Conclusions

On the basis of these results the writer has drawn the following conclusions:

1. Weight training does not have an adverse effect on circulo-respiratory responses as measured at rest and during exercise.
2. Weight training increases circulo-respiratory endurance as measured by the heart rate response to all-out exercise.
3. Neither system of weight training used in the study appears to be superior to the other in implementing improved circulo-respiratory responses on improved circulo-respiratory endurance. This conclusion also holds for muscle strength and indicates that weight training systems utilizing up to fifteen

repetitions per set bring about approximately the same effects on circulo-respiratory endurance and strength.

Microfilm \$2.50; Xerox \$6.20. 128 pages.

**THE DEVELOPMENT OF A PROPOSED
PROGRAM OF PHYSICAL EDUCATION FOR
THE PUBLIC SCHOOLS OF INDIA BASED ON
AN ANALYSIS OF INDIAN CULTURE
RELATING TO PHYSICAL EDUCATION
AND ON THE NATIONAL PROGRAMS
OF SELECTED COUNTRIES**

(L. C. Card No. Mic 59-6597)

Jeevanandam Pitchamuthu Thomas, Ed.D.
Boston University School of Education, 1959

Statement of the problem.

After one hundred and fifty years of foreign rule, India emerged as an independent nation on the 15th of August, 1947. Out of the medley of old and new, a great nation is struggling to come into being - a nation which while not forgetting her ancient past, is renewing her greatness along modern lines.

With the dawn of political independence, old problems have been partly solved, but many new problems still have to be dealt with. Along with economic problems, there are many issues of education, health, and social welfare. Educational reforms are of primary concern and the educational pattern has to be suited to the genius of the country and the democratic form of government, as stipulated by the Indian Constitution of 1949.

In this national regeneration, physical education has an added responsibility, and this study has been undertaken to provide the enrichment so much required and so long denied in the public schools of India.

The Purpose.

The purpose of this study has been to construct a functional and practical instructional program of physical education that will serve to meet the needs and enrich the lives of the boys of the public schools of India and also to serve as a guide for the Supervisors and teachers of physical education. The material presented along with the curriculum may well serve to acquaint those inschools with a broader knowledge of the scope of physical education and bring them into a realization of what is taking place now in Indian public schools; what is taking place in other countries like Germany, Sweden, Denmark, England, U.S.A. and U.S.S.R., and what should be the best program for the public schools of India in terms of the results and experience of the past, with due consideration for needs of the present and trends for the future.

The following are the specific purposes of this study:

1. To present a brief cultural survey of physical education in India, which may reveal certain patterns of physical education activities.
2. To analyze physical education programs in selected countries - Germany, Sweden, Denmark, England, U.S.A. and U.S.S.R. - which should indicate activities and designs.

3. Based on the preceding two - drawn from the Indian culture and from the programs of other countries and on the basis of the present and future needs - to develop a program of physical education activities for the public schools of India.

Limitations of the study.

1. The study is limited to enumerating the cultural implications of the Yogic system and the influences of Western countries on Indian physical education.
2. The study has been limited to the physical education program in the public schools - grades one to eleven, namely elementary grades 1 to 5, middle school grades 6 to 8, and high school grades 9 to 11.
3. A final limitation is the facilities and equipment available in Indian public schools.
4. The recommended program is adaptable to the present facilities and considerations of health education and recreation are not included.
5. The study is confined to the instructional program of physical education for boys.

The Study.

India's direct contribution toward the activities of physical education are: - Static type of body building exercises of the free arm types like Asanas, Bands, Baitaks, Apparatus work: - Malkamb, Lathi, Jambia, Fari Gadhka, weight-lifting and acrobatics; Combatives: - Kalari pyat, Fencing-sword and stick, wrestling and modified judo. Rhythmics: - Lazium, folk dancing and classical dancing. Games: - Kho kho, Kabadi, Atyapatya, Horse riding and polo, simple games.

No program of physical education can be built exclusively of these, as these activities are largely static, and the program is bound to be rigid and highly mechanical. These activities have no spontaneous appeal and their educational influence in an integrated scheme of general education is limited. Of course, some of them could be used to great advantage as body building exercises for adults, but to the growing boys it would have no intrinsic value.

In part II of the dissertation the following activities appeared to be the most acceptable physical education activities adaptable to India: Germany - the gymnastic apparatus work; Sweden - remedial and corrective calisthenics; Denmark - the primitive gymnastics associated with rhythm; England - open air recreation in games and school gymnastics; Soviet Russia - military gymnastics and marching; U.S.A. - simple games, lead up games and teams games and recreation.

There are some common activities practiced in several of these countries, and to avoid duplication, these activities are grouped under the following headings, such as body building exercises, apparatus work, rhythms, combatives, games, track and field, and aquatics. Each group is composed of several activities. Out of these groups, each activity is evaluated on a five point scale, as Superior 5 points, Very Good 4 points, Average 3 points, Poor 2 points, and Inferior 1 point, in terms of the objectives of physical education set for the public schools of India. These objectives are (1) The development of organic vigor and physical fitness, (2) The development of neuro-muscular coordination, (3) The development of mental and emotional fitness, (4) The development of social efficiency, (5) The development of recreational skills, (6) The development of culture.

Breaking up each group on the basis of the scoring for each individual activity, they fall into these three categories:

1. Activities of High value with a score of 20 and above out of 30.

Soccer, Field Hockey, Basketball, Volley Ball, Softball, Kho kho, Recreational games, Lead up games, Simple games, Relays, Track and Field items, Swimming and Diving, Wrestling, Rhythm fundamentals, Folk dances, Rhythm games, Mimetics and Story plays.

2. Activities of Medium value with a score of 16 to 20 out of 30.

Body building exercises, Stunts, Dands, Yogic exercises, Parallel bar, Ropes, Marching, Simple combatives, Lathi, Fari Gadhka, Cricket, Kabadi.

3. Activities of Low value with a score of 15 and below out of 30.

Namaskars, Vaulting box, Beams, Roman rings, Malkamb, Pommel horse, Fancy drills, Jambia, Judo.

The activities are further rated on the basis of the grade level and the order of preference is arranged for building up the total program of activities for the grade levels.

Elementary Grades Grades 1 to 3

1. Rhythms.
2. Games of low organization.
3. Simple apparatus work, with balls, clubs, hoops, benches, etc.
4. Simple combatives.
5. Body mechanics.
6. Aquatics. Getting used to water.

Elementary Grades Grades 4 and 5

1. Rhythms.
2. Simple games.
3. Apparatus.
4. Body mechanics.
5. Combatives.
6. Aquatics.
7. Recreational play.

Middle School Grades 6 to 8

1. Team games of the lead up games type.
2. Rhythms.
3. Combatives.
4. Aquatics.
5. Apparatus.
6. Recreational games.
7. Body building exercises.

High School Grades 9 to 11

1. Team games.
2. Recreational games.
3. Aquatics.
4. Combatives.
5. Rhythms.
6. Apparatus.
7. Body building exercises.

On the basis of this, the percentage of time allotment for each group of activities is worked out followed by a discussion of the relative importance of the Core, Elective, and Remedial program. Examples of evaluating the various types of activities in the program, the weekly and daily schedules are also indicated. On the basis of these, a detailed program of activities for the public schools of India are worked out as units for Elementary grades 1 to 3, 4 and 5, Middle school grades 6 to 8, and High school grades 9 to 11.

An application of the material presented in this study should lead up to the following conclusions:

1. It will serve to provide an educational pattern in physical education more compatible with the democratic setup in India.
2. It will help physical educators to develop a physical education program which will best contribute to the individual and society.
3. This can be used by administrators in various States as a guide for formulating their State curriculum, with local modifications and variations.

Microfilm \$4.60; Xerox \$16.20. 357 pages.

EDUCATION, PSYCHOLOGY

THE RELATIONSHIP BETWEEN TWO
METHODS OF EVALUATING
VOCATIONAL COUNSELING

(L. C. Card No. Mic 59-6369)

Robert Alexander Apostol, Ph.D.
University of Missouri, 1959

Supervisor: Robert Callis

This study attempted to determine what relationship exists, if any, between the case review and the external criterion methods of evaluating vocational counseling. The relationship was determined by comparing ratings of the adequacy of the vocational counseling process with ratings of the appropriateness of the present occupation. The hypothesis of the study was that no relationship exists between the two methods of evaluation.

The vocational counseling cases of the University of Missouri Testing and Counseling Service for the academic year 1951-1952 were selected for investigation. A follow-up questionnaire was constructed, revised, and then mailed to 141 former clients. An eighty-two per cent return was achieved using two follow-up letters. One hundred and fourteen cases were submitted for the judging. There were 109 cases for which final ratings of appropriateness of the present occupation and adequacy of the vocational counseling process were available. A contingency coefficient of .22 ($P > .05$) indicated that the hypothesis of no relationship could not be rejected.

The results gave no support for the assumption of valid criteria which underlies the case review method nor any support for the assumption that the external criterion is attributable to the counseling which underlies the external criterion method. In an attempt to determine the factors influencing the results, the writer reviewed four cases which were representative of those which contributed most to the lack of relationship. Two general factors were suggested. One factor concerned those cases judged inadequate counseling - appropriate occupation. It was felt that the self-actualizing forces operating within the individual clients were sufficient to motivate them toward appropriate occupations even though they received inadequate counseling. The second factor concerned those cases judged adequate counseling - inappropriate occupation. In these cases it was felt that the psychological make-up of the clients interfered with self-actualizing tendencies. Therefore, even though they received adequate vocational counseling, they could not realize their potential due to maladaptive defense mechanisms. Finally, a case was reviewed in which the counselor dealt effectively with the client's emotional problem as well as with his vocational problem.

Microfilm \$2.50; Xerox \$4.00. 75 pages.

MEASURING ATTITUDES OF HIGH SCHOOL
PUPILS TOWARD SCIENCE AND SCIENTISTS

(L. C. Card No. Mic 59-5319)

Sidney Leon Belt, Ed.D.
Rutgers University, 1959Introduction

This study was prompted by the results of a preliminary administration of a test on a small, restricted sample of high school pupils. The test, which was composed of factual items, purported to measure accuracy of perception of science and scientists. The results of the tryout yielded a favorable stereotype of science and scientists in contrast to the unfavorable stereotypes reported in two previous widely publicized studies. The two previous studies were based on large cross-sectional samples of high school pupils. Thus this investigator was confronted with the problem of whether the differences in the stereotypes so produced were due to sampling differences or whether they were due to differences inherent in the different measurement techniques employed.

Problem

This study analyzed the effectiveness of two techniques of attitude measurement. One instrument was composed of certain types of factual items of the multiple-choice variety and purported to measure accuracy of perception. The second instrument, which purported to measure favorableness of attitude, consisted of statements followed by fixed answer choices of the form -- agree-undecided-disagree (Likert-type). This study also compared the performance of a relatively high-level ability group with that of a cross-sectional sample on Likert-type items.

The experiment

The experimental population consisting of 516 college-bound seniors from 12 New Jersey high schools was first administered a 20-minute questionnaire consisting of items which are commonly hypothesized to be either precursors or outcomes of attitudes toward science and scientists. Approximately two weeks later the experimental population was administered both the accuracy of perception test (factual items) and the favorableness of attitude test (Likert-type items). The items of the two tests were matched as to content.

Summary of findings

Although a significant positive correlation was observed between the attitude and perception tests, the correlation was too low to consider the two tests measures of the same function.

For 22 of the 29 Likert-type items used in the study, the most popular response was the one for which maximum credit was awarded. That is, the pupils generally indicated a "favorable" attitude. An examination of the content of the remaining seven items and a comparison of their response pattern with parallel perception (factual) items suggested the ambiguous nature of the task that Likert-type items often present to respondents.

Twenty of the Likert-type statements used in this study appeared exactly as they did in the Purdue Opinion Panel Polls. A comparison of the percentage responses obtained in this study and by the Purdue Opinion Panel seemed to indicate that relatively high ability pupils have more favorable attitudes toward science and scientists than do a representative cross section of high school pupils. This conclusion was reached even though there was strong evidence that a response set of acquiescence was working against the Purdue sample.

The findings of this study do not support the implications drawn from two highly publicized studies which expressed concern for the nation's future supply of scientists. The college-bound high school pupils of this study, a group that contains a relatively high percentage of pupils that have sufficient academic ability to pursue a scientific education, generally manifested favorable attitudes toward science and scientists.

Conclusions

When beliefs are probed by means of factual items, which purport to measure accuracy of perception, less ambiguous stimuli are presented to the subject than when fixed-response (Likert-type) items, which purport to measure favorableness of attitude, are used. Furthermore, an examination of the pupil responses to such items appears to provide information of considerable value for curriculum development and modification. Although the study concerned science and scientists, it seems reasonable to expect that accuracy-of-perception items should prove equally effective in probing underlying beliefs concerning other social and cultural institutions.

Microfilm \$2.50; Xerox \$8.20. 180 pages.

A STUDY OF THE EFFECTS UPON TEACHERS OF PARTICIPATION IN A CURRICULUM EXPERIMENT

(L. C. Card No. Mic 59-6807)

Jack Laurence Campbell, Ed.D.

The University of Nebraska Teachers College, 1959

Adviser: Dr. William E. Hall

The purpose of this study was to investigate the effects which participation in the Nebraska Community Education Project Curriculum Experiment had upon teachers. Effects which were studied included: a) teachers' attitudes and beliefs about certain educational concepts; b) evidences of change in teacher-pupil rapport; and c) indications of teacher understanding of the role of students, teachers and the community in public education.

The schools of four Nebraska communities associated with the Nebraska Community Education Project, (NCEP), took part in the Curriculum Experiment. The experimental period included the 1958-1959 school year and this study included 102 teachers of science and social studies in grades three through twelve. Teachers in the experimental programs were encouraged to experiment with: a) experience-centered learning activities; b) wise use of community resources; and c) the concept of community

improvement as one goal of education. Public schools in two communities not participating in the NCEP agreed to serve as control groups. Seventy-one teachers were from the Curriculum Experiment schools and 31 teachers comprise the control group.

During the experimental period, teachers in the four NCEP schools were encouraged and aided by local administrative personnel and by the NCEP staff from the University of Nebraska Teachers College to carry on experimental activities with their classes. Conferences and workshops were arranged for their participation, and teachers were asked to make monthly reports of their most successful activities.

Within the experimental group, 25 teachers were identified as most active in the Curriculum Experiment and ten were identified as least active. Comparisons of change were made between these High and Low groups as well as between the total Curriculum Experiment group and the control group.

A Teacher Personal Interview was constructed containing 13 open-end questions and responses to each question were objectively scored. A Student Questionnaire Schedule was constructed and administered to all students in grades three through 12 in Curriculum Experiment schools and control schools. A Supervisor Rating Scale was devised to obtain a faculty supervisor rating on each teacher included in the study. These three instruments were administered in the fall and spring of the experimental period to identify and measure changes which occurred among the teachers.

Coefficients of reliability were computed between scores obtained from fall and spring administrations of these instruments in the control schools. For the Teacher Personal Interview, $r = .820$; for the Student Questionnaire Schedule, $r = .965$; and for the Supervisor Rating Scale, $r = .796$.

Analysis of the data was made with direct reference to twelve hypotheses which had served to direct the study. Statistically significant changes occurred for at least one group of teachers on six questions of the Teacher Personal Interview. Mean changes in total scores on the interview were statistically significant for each of the four groups of teachers studied. Differences in mean change scores between groups were found to be significant on four questions of the Teacher Personal Interview.

Analysis of change for each group in Student Questionnaire Schedule ratings indicated that the High group was the only group which did not receive lower ratings from students in the spring than in the fall. The Low group received significantly lower ratings in the spring than in the fall.

Analysis of faculty supervisor ratings indicated that the Curriculum Experiment teachers were rated significantly lower in the spring, while control group teachers received higher ratings in the spring. Supervisor ratings of the High group remained stable, while ratings of the Low group dropped significantly from fall to spring.

The results of this study indicate that a significant relationship existed between the extent to which teachers were active in the Curriculum Experiment and: a) teachers' ability to expand their concept of the purpose of education; b) development toward a more student-centered philosophy of education; c) willingness of teachers to have students share in planning their educational experiences; and d) the interest students indicated in the classes

taught by these teachers. Results of analysis of faculty supervisor ratings indicate that as supervisors became involved in specific educational planning, their level of expectation from their teachers increased significantly. The most significant findings were that the Curriculum Experiment teachers changed and most of the changes were closely related to their attitudes toward students.

Microfilm \$2.80; Xerox \$9.70. 214 pages.

**THE EDUCATIONAL EFFECTS OF AN
ACCELERATED PERSONNEL PROGRAM
IN THE MEN'S RESIDENCE HALLS
AT THE UNIVERSITY OF MISSOURI**

(L. C. Card No. Mic 59-5622)

Wallace Eugene Clingan, Ed.D.
University of Missouri, 1959

Supervisor: Robert Callis

Purpose: It was the purpose of this study to determine the educational effects, if any, of an accelerated personnel program when contrasted with the existing (standard) program. Primarily, the accelerated program was devised to bring about increased attention to and an awareness of the individual student. Criteria for the study were: (1) Number of drop-outs. (2) Grade point means. (3) Extra-curricular participation in residence hall activities. (4) Number of social isolates. (5) Number of disciplinary cases. (6) Attitude of residents toward the residence hall program.

An attempt was also made to determine the degree of difference between two architectural styles of residence halls on the above six criteria.

Method of Research: Three hundred and fifteen freshmen were randomly assigned in four residence halls. Two halls (one with the vertical and one with the horizontal architectural style) were selected for the accelerated program. The other two halls (one of each architectural style) were to continue with the standard personnel program.

At the end of the first semester, tests of significance of differences were made between the accelerated and the standard program on the above six criteria. Degree of differences were determined also between the two architectural styles.

Summary: In light of the evidence submitted in this study, the following conclusions may be drawn:

- (1) There were fewer social isolates in the accelerated program. This was true not only at the end of ten weeks but also at the end of the twenty-second week. The degree of difference was greater at the twenty-second week which indicated that the effect of the accelerated program was not temporary and that the positive results continued during the academic year.
- (2) The personnel practices employed in the accelerated program created a more positive attitude toward the residence hall personnel program.

- (3) The personnel practices utilized in the accelerated program did bring about a greater degree of participation in residence hall activities upon the part of freshmen residents.

- (4) In comparing the architectural styles, no differences existed except that the accelerated program in the vertical style increased the degree of participation in residence hall activities and created a more positive attitude of the residents toward the residence hall program over that obtained in the horizontal style.

During the investigation of this study, it became apparent that additional research of the nature indicated below would be of value to residence hall programs.

- (1) The number of drop-outs in the accelerated program was less than the number in the standard program but not significantly so. In light of these results, it is reasonable to postulate that if the personnel practices followed in the accelerated program were accelerated even more, the number of drop-outs might be reduced significantly. It is recommended that an investigation be conducted in this area.
- (2) In many institutions, the architectural style of the residence hall controls the structure of the student program. When comparing the two architectural styles in this study, the differences indicated a trend in favor of the vertical style only if the accelerated personnel practices were utilized. If the accelerated personnel practices were more refined in the vertical architectural style, it is reasonable to postulate that the differences might be significant in the areas investigated by this study. This should be investigated.

Microfilm \$2.50; Xerox \$5.60. 113 pages.

**ACADEMIC FAILURE, REINSTATEMENT,
AND FOLLOW-UP.**

(L. C. Card No. Mic 60-739)

Paul Leon Gardner, Ph.D.
The Ohio State University, 1959

The dissertation was a study of the academic success or failure of students who had been reinstated in the Ohio State University after having been dismissed for academic reasons. It was important to study such students because of the numbers of such individuals who become academic failures each year in institutions of higher learning.

This study was designed to be a broad preliminary investigation of the behavioral dynamics that might be reflected in the academic and socio-psychological data available on seventy-six students who were granted reinstatement, Winter Quarter, 1959. These data became available as a result of a requirement that all students seeking re-admission to the university must take a series of psychological tests at the University Counseling and Testing Center. The tests included The School and College Ability Test, The Strong Vocational Interest Blank, The Minnesota

Multiphasic Personality Inventory, The Stern Activities Index, and an Autobiographical Questionnaire. The results of the Ohio State Psychological Examination, administered at the time of the students' initial enrollment, were used in place of the School and College Ability Test. The results of these tests were evaluated by counselors and reported to the college officers. One hundred and eleven of the 212 students who petitioned for reinstatement were admitted, and eighty were rejected. The remaining twenty-one did not complete their petitions. Twenty-five successful petitioners did not enroll.

The seventy-six students who enrolled Winter Quarter, 1959, were followed through two academic quarters to determine the outcome of their reinstatement. Seven of these students withdrew before the study was completed. The data were first synthesized into case summaries representing the students. These summaries provided a means of searching for clues and syndromes of behavior that might be important in understanding the success or failure of these students. Chi square was the statistical technique used to test the factors that discriminated between the successful and unsuccessful student.

Conclusions:

1. Though carefully selected, nearly half of these students had a second failing experience, which suggests the importance of further research on this problem.
2. The academic, socio-psychological data available on these students were productive in revealing a syndrome of behavior that manifested the following dynamics: (1) a wide range of general ability; (2) a wide range of interests, with unsuccessful students showing no negative interest patterns; (3) a tendency to make scores of sixty-one or higher on the Minnesota Multiphasic Personality Inventory personality scales, and reveal K-scores of 17 or higher on the K-scale of the same instrument; (4) a tendency to reflect either submissive withdrawal or aggressive-ascendant personality structures on the Stern Activities Index; and (5) a tendency to show a regression in grade-point average from the first to the second quarter of reinstatement. Microfilm \$3.80; Xerox \$13.50. 296 pages.

A REPLICATION STUDY OF AN EXPERIMENT APPLYING NON-ARISTOTELIAN PRINCIPLES IN THE MEASUREMENT OF ADJUSTMENT AND MALADJUSTMENT

(L. C. Card No. Mic 60-539)

Robert Floyd Hopkins, Ed.D.
Michigan State University, 1958

Major Professor: Walter F. Johnson

Objectives

Fundamental in the undertaking of this investigation was the objective of replicating an experimental study based on non-Aristotelian principles in which a one-hundred item, true-false test was established as an instrument to determine the degree of social adjustment and maladjustment among individuals. The "IS of identity" concept,

formulated by Alfred Korzybski in his book, *Science and Sanity*, formed the foundation on which this instrument was devised by Dr. Thomas M. Weiss. Other objectives which formed an extension of the basic work were as follows:

- A. To determine if the "IS of identity" instrument would discriminate among institutionalized and noninstitutionalized Caucasians and Negroes.
- B. To determine if social status were a factor in the use of the "IS of identity."
- C. To determine if the instrument would discriminate between two institutionalized groups.

Selection of Sample

A total of 214 individuals from the following high schools were randomly selected as the noninstitutionalized group: Allen Park, Dearborn Township School District Number 8, Ecorse, Melvindale, and Romulus. The institutionalized group consisted of 116 adolescents at the Wayne County Juvenile Detention Home, and 57 mental patients at the Wayne County General Hospital. For the noninstitutionalized group the following information was obtained: I.Q., sex, age, religious affiliation, church attendance, self-rating, teacher-ratings, occupation of the principal income worker, race, and "IS of identity" test score. With the exception of teacher-ratings and occupation, the same information was obtained for the adolescents at the Juvenile Detention Home. For the mental patients the following data was collected: I.Q., sex, age, religious affiliation, church attendance, race, and diagnosis.

Methodology

In replication of the Weiss study, the analysis of variance statistical technique was applied to: (1) age, (2) sex, (3) religious affiliation, (4) church attendance, (5) self-ratings, (6) teacher-ratings, (7) institutionalized versus noninstitutionalized. As an extension of this work the following categories were also analyzed in like manner: (1) noninstitutionalized Negroes versus Caucasians, (2) institutionalized Negroes versus Caucasians, (3) prestige of occupation, (4) diagnosis of mental patients, and (5) Juvenile Detention Home persons versus mental patients. Where significance was indicated, covariance adjustment was used to eliminate the I. Q. influence which was shown by correlations between intelligence and test score to be an influence.

Findings

Highly significant differences (at the 0.01 probability level) were found between the means of the "IS of identity" test scores and, (1) self-rating category 103 (a part of the "IS of identity" test), between institutionalized and non-institutionalized, (2) intelligence (institutionalized, non-institutionalized), (3) institutionalized versus noninstitutionalized, with covariance adjustment to hold intelligence constant, (4) Negroes and Caucasians (noninstitutionalized), (5) teacher-ratings (Romulus high school), (6) teacher-ratings (a composite of all high schools), and (7) Juvenile Detention Home persons and mental patients.

Significant differences (at the 0.05 probability level) were found for: (1) age levels at the Juvenile Detention Home, (2) self-rating categories 101, 102, 103, 104, and 105 for noninstitutionalized persons, (3) self-rating

category 101 (institutionalized, noninstitutionalized), and (4) self-rating category 104 (institutionalized, noninstitutionalized).

Microfilm \$2.50; Xerox \$6.40. 132 pages.

THE USE OF DISCRIMINANT ANALYSIS FOR PREDICTING FRESHMAN PROBATIONARY STATUS

(L. C. Card No. Mic 59-6812)

John Michael Ivanoff, Ed.D.

The University of Nebraska Teachers College, 1959

Adviser: Charles O. Neidt

Purpose of Study

The purposes of this study were as follows: a) to develop probability tables to predict probationary status for entering freshman students at the University of Nebraska on the basis of discriminating evidence obtained at the time of matriculation; and b) to validate and demonstrate the application of the tables in a practical situation.

Method of Procedure

The criterion was defined in terms of probation-non-probation status at the end of the first semester, and the prediction variables investigated consisted of American Council on Education Psychological Examination "Linguistic" and "Quantitative" scores, Nebraska English Placement Examination score, quarter rank in high school graduating class, size of high school of graduation, and father's occupation.

The major hypothesis to be tested was: There is no significant relationship between probationary status of first semester entering freshman students at the University of Nebraska and the prediction variables adopted.

To test the hypothesis, data were gathered from 2,012 male and 415 female freshman students from the Colleges of Engineering and Architecture, Arts and Science, and Business Administration at the University of Nebraska for the academic years 1955, 1956, and 1957.

Before a test of the major hypothesis could be made, it was necessary to evaluate the relationship between sex, year, and college of matriculation. Chi-square analyses were made, and, as a result, the samples were combined with respect to college and year of matriculation, but were kept separate on the basis of sex. Sub-samples of 900 males and 141 females were drawn for use in the remainder of the study.

To test the major hypothesis, an application of Fisher's discriminant analysis with its serial correlation was made.

Serial correlations were computed between each prediction variable and the criterion for both male and female students. Size of high school and occupational status were found not to relate significantly to the criterion and were eliminated from the prediction scheme. Using the four remaining variables, discriminant equations were solved to determine the best prediction combination. F-tests were utilized to test for significant loss by elimination of the variables in each prediction scheme.

To facilitate the application of the discriminant analysis for personnel workers, probability tables for male and female students were constructed by using the optimal combinations of prediction variables.

The tables were validated with entering freshman students at the University of Nebraska for the year 1958-1959. Chi-square analyses were used to test the relationships between actual predictions and chance predictions of probability status.

The tables were later applied to three counseling situations to demonstrate their practical utility, both in identifying probable probation students, and in establishing the control of pertinent independent variables. Chi square was used to determine the relationship between students counseled and not counseled and probationary status. In each situation, t-tests were employed to test the significance of the difference between counseled and non-counseled students on the basis of semester grade average.

The major hypothesis was rejected since the discriminant analysis demonstrated that the combination of ACE-"L" score, English score, and quarter rank variables did effectively discriminate male probation students from non-probation students, and the combination of English score and quarter rank variables did effectively identify female probation students.

The prediction tables for both male and female students were found to be a valid predictor of probationary status since the predictions were found to be far more accurate than that which could have been expected by chance.

The prediction tables were demonstrated as being effective in identifying probationers and in establishing controls of pertinent variables employed in three counseling experiments. Significant relationship was found between counseled students and probationary status only when the counseling was offered early in the academic year.

Microfilm \$2.50; Xerox \$5.80. 116 pages.

THE INFLUENCE OF READING ABILITY ON GROUP INTELLIGENCE TEST SCORES

(L. C. Card No. Mic 59-5719)

John Patrick Kelly, Ph.D.

State University of Iowa, 1959

Chairman: Professor William Eller

This investigation was undertaken to study the influence of reading ability on group intelligence test scores. In this connection, relationships among the variables, reading comprehension, reading rate, and group intelligence test performance, were analyzed.

For the experiment two forms of the Otis Quick-Scoring Mental Ability Tests, two forms of the Cooperative English Tests, Reading Comprehension, the Diagnostic Reading Tests, General Rate Tests, and the third form of the Otis Quick-Scoring Mental Ability Tests modified as a rate test, were administered to 528 ninth grade subjects. One form of the intelligence tests and one form of the reading comprehension tests were recorded on magnetic tape to be used as a dictated or listening form of these tests. Special answer sheets were designed along with the recorded forms to eliminate the factor of reading

ability from the listening tests. A Type III design was used to calculate two pair of analyses of variance for the data obtained in this study.

The first pair of analyses consisted of grouping the subjects into three levels of comprehension, high, average, and low, using the conventionally administered English Cooperative Test and into three levels of rate, in the first analysis using the Diagnostic Rate Test and in the second analysis, the Otis Rate Test. Scores on the Otis Quick-Scoring Mental Ability Tests administered both conventionally and as a listening test were available for the subjects in each of the nine resulting groups.

The second pair of analyses consisted of grouping the subjects into three levels of intelligence, high, average, and low, and as in the first pair of analyses, the Diagnostic Reading Rate Test was used in one analysis and the Otis Rate Test in the second analysis to group subjects into three levels of rate. The scores on the English Cooperative Tests administered both conventionally and as a listening test were available for the subjects in each of the nine resulting groups.

Since the Type III design requires proportionality of cells, data were discarded at random in such a manner as to retain as much of these data as possible for each of the analyses.

The results of the pair of analyses to investigate the influence of reading ability on group intelligence test scores indicate that regardless of an individual's reading ability, the scores obtained on the conventionally administered intelligence test are significantly higher than on the form administered as a listening test. The reading rate as measured by a conventional reading rate test is related to the scores obtained on the group intelligence tests used in this study, but reading rate measured on an intelligence test is not. It was also found that individuals with high reading comprehension tend also to have high intelligence.

Another aim of this study was to investigate the effects of reading rate and intelligence on two types of comprehension tests (conventional and listening). It was found that the conventionally administered comprehension tests used in this study give a significantly higher score on the average than do the listening comprehension tests. Reading rate has little or no influence on scores obtained on these comprehension tests while individuals with high intelligence tended also to be high in comprehension.

As the results indicate, this study failed to corroborate the oft-cited claim that poor readers are at a considerable disadvantage when taking group intelligence tests. This failure to establish a reading handicap on intelligence test scores does not, of course, mean that no such disadvantage exists, and the alteration of certain of the experimental conditions might have led to markedly different results.

Microfilm \$2.50; Xerox \$7.00. 146 pages.

THE RELATIONSHIP OF DISCREPANT ACADEMIC ACHIEVEMENT TO LATER PERSONALITY ADJUSTMENT

(L. C. Card No. Mic 59-6390)

Joseph Tyree Kunce, Ph.D.
University of Missouri, 1959

Supervisor: Robert Callis

The purpose of this study was to investigate the relationship of discrepant academic achievement to later personal and social adjustment. Discrepant achievement was defined as academic achievement either higher or lower than expectations based upon intelligence test scores. The underlying hypothesis of the research was that indices of current personal and social adjustment could be predicted from the degree of past discrepant achievement.

A total of 71 Missouri high school graduates who had records of psychiatric hospitalizations were obtained for the experimental group. A control group was formed by matching upon intelligence each experimental subject with a student of the same sex and same graduating class. All subjects had participated in the Missouri College Aptitude Testing Program. Therefore, records were available of each student's scores using established state norms for Missouri high school seniors. The class rank percentiles were also converted into standard scores. The difference between these measures provided the dependent variable for this study.

The main and interactional effects of three independent variables upon discrepant achievement scores were tested by a 2 X 2 X 2 factorial design. The variables were: Adjustment status, known record of psychiatric hospitalizations and absence of such record; age level, and sex. Additional analyses were also undertaken. The frequency of under- and overachievers in the hospital sample was compared to that of the control group by means of a contingency table. Using only the experimental subjects the effects of current hospital status and marital status were evaluated by the t-test. In addition, correlations and intercorrelations among measures of discrepant achievement, duration of illness, age of onset of illness, and age of subject were undertaken.

Significant differences beyond the .05 level were found in the following: the mean discrepant achievement score for the experimental group was higher than that of the control group; the mean of the never married group was higher than that of the ever married group; and the mean discrepant achievement score for the currently hospitalized subjects was greater than that of the formerly hospitalized subjects. Discrepant achievement scores correlated significantly, -.43, with the age of the patients. There was also a small, but significant correlation, .24, of these scores with duration measures when statistical correction for the age of the patient and age of onset were introduced.

An investigation into the relationship of discrepant achievement to psychiatric diagnostic categories was carried out with no significant findings. However, it was observed that there was a high proportion of underachievers among patients with paranoid diagnoses and a high proportion of overachievers among those with a catatonic diagnoses. Furthermore, it was discovered that the mean intelligence test score for the paranoid group was significantly higher than that of the control group.

The mean standard scores for intelligence and achievement for the hospital group, the control group, and even the entire state norm population were essentially the same. The relative proportions of under- to overachievers in the control and experimental groups were almost identical. Consequently, intelligence level alone, achievement level alone, or direction of achievement above or below measured intelligence is apparently not related to later emotional disturbances. However, the degree of discrepancy between intelligence and achievement is significantly related to indices of adjustment.

Microfilm \$2.50; Xerox \$4.80. 93 pages.

**A STUDY OF THE MUSICALITY,
INTELLIGENCE, AND MUSIC ACHIEVEMENT
OF VOCALISTS AND INSTRUMENTALISTS
IN SELECTED HIGH SCHOOLS.**

(L. C. Card No. Mic 60-810)

Gus C. Lease, Ed.D.

State University of South Dakota, 1959

Supervisor: Professor Joseph T. Fisher

The Purpose and Procedure of the Study

The purpose of this investigation was to ascertain the differences between vocalists and instrumentalists in musicality, intelligence, and music achievement. The subjects were music students enrolled in selected high schools. The selected characteristics were measured by standardized objective tests. The tests used in this study were: the Seashore tests for pitch, rhythm, and tonal memory; the Drake Musical Memory Test; the Kwalwasser-Ruch Test of Musical Accomplishment; and, the School and College Ability Test.

The population used in this study included those senior music students enrolled in chorus, band, or orchestra who had participated for three years exclusively in instrumental music or exclusively in vocal music. The groups consisted of 150 vocalists and 105 instrumentalists. The sample was obtained from seven high schools with enrollments ranging from 660 to 1970. These included one in South Dakota, four in Iowa, and two in Nebraska.

The principal statistical techniques used in this study were the Pearson product moment coefficient of correlation, analysis of variance, the t-test of significance, and the Z-value.

The Results of the Study

Significant differences were found between the instrumentalists and vocalists in the following tests:

1. S. C. A. T. Quantitative
2. Seashore Pitch
3. Seashore Tonal Memory
4. Kwalwasser-Dykema Rhythm
5. Kwalwasser-Dykema Tonal Memory
6. Drake Musical Memory
7. Kwalwasser-Ruch Test of Musical Accomplishment

In each of the above analyses, the instrumentalists had the highest mean value.

No significant differences were found between the instrumentalists and the vocalists in the following tests:

1. S. C. A. T. Verbal
2. S. C. A. T. Total
3. Seashore Rhythm
4. Kwalwasser-Dykema Pitch

There was a significant difference between the four instrument groups on the Kwalwasser-Dykema Rhythm test. The string group scored the highest mean.

No significant differences were found between the four instrument groups, namely: woodwinds, brass, percussion, and strings in the following tests:

1. S. C. A. T. Total
2. Seashore Pitch
3. Seashore Rhythm
4. Seashore Tonal Memory
5. Kwalwasser-Dykema Pitch
6. Kwalwasser-Dykema Tonal Memory
7. Drake Musical Memory
8. Kwalwasser-Ruch Test of Musical Accomplishment

The results obtained by the analysis with respect to the relationships between the S. C. A. T. and the three music aptitude tests and the results obtained between the S. C. A. T. and the music achievement test of this study seem to warrant the following conclusions:

1. Low but positive relationships were found between the variables of music aptitude and intelligence.
2. Intelligence, as measured by the S. C. A. T., was moderately related to music achievement as measured by the Kwalwasser-Ruch test.

The significant relationships between the part scores on the three music aptitude scores of this study warrant the following conclusions:

1. The variable of Seashore Pitch test was correlated positively, but low, with the K.-D. Pitch test.
2. The variable of Seashore Rhythm test was moderately related to the K.-D. Rhythm test. The r was .521 for the vocalists and .268 for the instrumentalists.
3. The variable of Seashore Tonal Memory test had a correlation of approximately .50 with that of the K.-D. test.
4. The correlations between the Seashore Tonal Memory test, the K.-D. Tonal Memory test, and the Drake Musical Memory test was about .50.

Microfilm \$2.50; Xerox \$7.60. 165 pages.

**A STUDY OF THE EFFECT OF
SELECTED GUIDANCE ACTIVITIES
UPON ELEMENTARY SCHOOL CHILDREN**

(L. C. Card No. Mic 59-6364)

Lynn Wiseman Martin, Ed.D.
University of Missouri, 1959

Supervisor: John L. Ferguson

PURPOSE: To determine the effectiveness of certain guidance activities upon the personal-social adjustment and the concomitant educational achievement of four groups of fifth grade children for a period of ten weeks.

PROCEDURE:

- (1) The groups were matched for intelligence and social-status characteristics by utilizing the California Test of Mental Maturity and the Warner-Meeker-Eells method of computing the Index of Status Characteristics. Tests for analysis of variance indicated that the groups were comparable with respect to intelligence and social-status characteristics.
- (2) Pre-test characteristics of the groups, relative to personal-social adjustment and educational achievement, were measured at the beginning of the experiment. The Rogers Test of Personality Adjustment, the SRA Junior Inventory, and the California Achievement Test were utilized as pre-test instruments. Tests for analysis of variance indicated that the groups were comparable with respect to total educational achievement and total personal-social adjustment.
- (3) The groups were designated as Group I (experimental group), Group II, Group III, and Group IV (differentially treated control groups).
- (4) Treatment for groups: (a) Group I--The teacher was furnished the results of all pre-tests and an evaluation of each child. The investigator read stimulus stories dealing with behavioral problems of fifth grade children for one hour each week to the children. This was followed by a free discussion of the problem and written expressions about the story or discussion. Other guidance activities included: Group therapy, individual counseling, role-playing, individual testing, attention to physical handicaps, counselor-parent conferences, and teacher-counselor conferences. (b) Group II--The teacher was furnished the results of all pre-tests and an evaluation of each child. The services of the investigator as a consultant were available. (c) Group III--The teacher was furnished the results of all pre-tests and an evaluation of each child. The services of the investigator as a consultant were not available. (d) Group IV--The teacher was not supplied test results and evaluations until the end of the experiment.
- (5) At the end of the ten weeks the students of all groups were again administered tests of personal-social adjustment and educational achievement.

SUMMARY:

- (1) There were significant differences in the educational achievement of the four groups. T-tests indicated significant differences between Groups I and II, Groups I and III, Groups I and IV, but non-significant differences between Groups II and III, Groups III and IV.
- (2) There were significant differences in the personal-social adjustment of the four groups. T-tests indicated significant differences between Groups I and II, Groups I and III, Groups I and IV, but non-significant differences between Groups II and III, Groups III and IV.

CONCLUSIONS:

- (1) Guidance services will bring about significant positive changes in the personal-social adjustment of fifth grade children when the services of a school counselor are devoted to a formal and systematic program of guidance activities that are integrated with the regular instructional process. This change in students' adjustment is unlikely when their teachers are provided only an evaluation or an evaluation and counselor consultation concerning their personal-social adjustment.
- (2) Concomitant with the increased personal-social adjustment brought about through a formal and systematic program of guidance activities, there will be a significant increase in the educational achievement of these students when contrasted to normally expected gain. This accompanying increase in educational achievement is unlikely when the teachers are provided only an evaluation or an evaluation and counselor consultation concerning the personal-social adjustment of their students.

Microfilm \$2.65; Xerox \$9.25. 201 pages.

**ARTICULATION IN SELECTED NEW JERSEY
JUNIOR AND SENIOR HIGH SCHOOLS**

(L. C. Card No. Mic 59-5325)

John L. O'Brien, Ed.D.
Rutgers University, 1959

Problem. To investigate articulation practices in twenty-seven New Jersey junior and senior high schools; to determine to what extent principles of articulation as represented in the literature were operative in existing practice; and to suggest procedures relative to an articulation program for the ninth and tenth grades, Linden Public Schools, Linden, New Jersey.

Importance of study. Program needed in Linden because of expanding school population and the administrative and teacher demands for a more efficient transition of pupils from grades nine to ten. The study should prove of interest to similar communities with like problems.

Procedure and scope. A New Jersey sample was established by means of such considerations as willingness to participate, type of similar community to Linden (largely industrial), geographic distribution, and recognized outstanding programs or practices in articulation under the leadership of guidance functionaries who have been pre-eminent in guidance in New Jersey. The twenty-seven schools in the sample were located in Camden, Elizabeth, Newark, and Trenton.

One hundred twenty schools throughout the country but not in New Jersey were inventoried relative to articulation programs and practices. These schools were suggested by forty-seven state departments of education and authorities in the field. From these 120 schools, twenty were selected for "special study."

Summary. A list of principles was formulated from the literature. An analysis of ratings assigned to the principles indicated that most of the principles were operative in existing practice in the twenty-seven New Jersey schools.

The respondents indicated that the counselor or a combination of principal, vice-principal, and counselor were responsible for administering the articulation program.

The junior high school respondents indicated that the promotion procedure, an aspect of articulation, was a co-operative one that included vice-principal, counselor, and teacher. Some respondents indicated that, in some instances, it was necessary and desirable to consult with the principal.

The senior high school respondents indicated that it was the teachers' responsibility to decide promotion on the basis of their locally established standards.

The New Jersey respondents considered the following practices important for good articulation: (1) course selection; (2) junior high school visitation to senior high school; (3) student records; (4) joint meetings of junior and senior high school staffs; (5) parent participation; (6) senior high school counselor and pupil participation in ninth grade orientation programs; and (7) orientation programs at opening of school.

New Jersey respondents designated the following areas inadequate and in need of improvement with respect to articulation: (1) professional meetings; (2) cooperation of professional staff; (3) course information; (4) parent participation; and (5) visitation to senior high school.

Twenty of the twenty-seven schools listed inadequacies. However, ten of the twenty indicated contemplated changes to correct these inadequacies; eight listed no changes; and two proposed changes which did not correct the inadequacies reported.

Conclusions. The high degree of operativeness assigned to the principles indicated that they could be used with confidence as a basis for formulating an articulation program for the Linden Public Schools.

There was evidence that the guidance personnel of the junior and senior high schools knew too little about the operativeness of each other's respective articulation programs.

Implications. More effective in-service training of guidance and all other personnel regarding articulation.

All guidance department functionaries, such as the school psychologist and the school social worker, should be made greater use of in problem cases.

The program of articulation for the Linden Public Schools should be based on the principles as formulated from the literature and as tested through this study.

Microfilm \$2.65; Xerox \$9.20. 203 pages.

EVALUATION OF COUNSELING WITH A GROUP OF SOUTHERN UTAH PAIUTE INDIANS

(L. C. Card No. Mic 59-6531)

Harold Wesley Osborn, Jr., Ph.D.
University of Utah, 1959

Chairman: Reed M. Merrill

THE PROBLEM

1. Is it possible to establish a counseling relationship resulting in an observable change in the Southern Utah Paiute Indian counselee?
2. Were there any changes in "discomfort" or "tension" of the Southern Utah Paiute Indian group because of the new situation which they were in as revealed by the interview material?
3. Was it possible to analyze the interviews of the Paiute Indian group in terms of content in a manner which would be useful in future work with Indians, and was this content related to any of the other variables used in the study?
4. Was the group of Southern Utah Paiute Indians capable of learning vocational and technical skills?

THE METHOD

Recorded, verbatim typescripts of interviews with nine full-blooded Paiute Indians were analyzed using three variables, "talk ratio," "per cent of one-word responses," and D.R.Q. The differences in the amount of talk and discomfort were noted from first to final interviews. The conversation in the interviews was divided into various "topics of conversation."

The "topics of conversation" were compared with the amount of counselee talk and with the amount of discomfort present in various interviews.

CONCLUSIONS

1. Counseling was seen as not successful. The reasons for this lack of success could be either the total situation was too difficult for the Indian or the measures used were inappropriate or the individuals in the group studied were not yet ready for counseling.
2. Other types of help for the Indian such as "sponsor" or "big brother" or group sessions with all trainees participating should be provided for future trainees.
3. The evidence in regard to the ability of the Indian trainee to learn vocational skills is mixed. The reports from shop instructors indicated the Indian trainee had the ability. Test data and non-completion of training courses would contradict the instructors' reports. It is also possible that the reports represented an unrealistic evaluation and "satisfactory" was assigned if the student merely attended class and created no problem.

4. There was a considerable range of individual differences indicated by the various case records and evaluation results.

5. The Indian trainees did not individually identify with any specific enduring problem. The counselor saw the circumstances of the individual Indian as a problem, but because the Indian did not recognize his situation as a problem it may be said that for him no problem existed.

6. Counseling with similar groups to the one studied should be conducted along the lines of assistance with immediate problems. Long term plans should not be emphasized.

7. More time in the interview contact should be allotted to "preparing" the counselee for counseling.

8. The potential for the establishment of an improved counseling relationship may have been present in a part of the sample since one third of the cases indicated more talk in the final interview.

9. Training programs for Indian groups should not be directly supervised by the federal government.

10. Learning situations for the Indian should be devised on a very elementary and non-abstract level.

11. More Indians should be encouraged to enter training situations away from the reservation. Psychological support should be available to them and if necessary financial assistance should be provided.

RECOMMENDATIONS

1. The available typescripts should be used to evaluate counselor techniques.

2. A follow-up study of this group should be undertaken to determine if there were any long term changes that could be identified with their counseling experience.

3. Where possible, additional counseling studies should be made on other Indian groups utilizing more than one counselor.

4. An evaluation should be made of training experience and the amount of time spent away from the reservation.

5. A method should be devised for counseling Indian students in the elementary school and studying the effect on eventual educational level.

6. A study comparing the success of counseling with mixed-blood and full-blood Indians should be made.

7. A comparison study of various approaches to counseling applied to Indian students should be made.

8. Application of social case work methods to a group of Indian trainees should be studied.

9. A method of evaluating the intellectual potential of the Indian student should be devised.

10. A counseling study should be made of the Southern Utah Paiute Indians while they are living on their various reservations.

Microfilm \$2.50; Xerox \$6.40. 134 pages.

A STUDY OF PERSONAL AND SOCIAL ADJUSTMENT OF SEVENTH GRADE BOYS AND GIRLS AS INFLUENCED BY PHYSICAL SIZE, ATHLETIC ABILITY, ACCEPTANCE BY PEERS, AND ACCEPTANCE OF PEERS.

(L. C. Card No. Mic 59-2797)

Lake C. Oxford, Ed.D.
University of Maryland, 1958

Supervisor: Professor Fred R. Thompson

Purpose

The purposes of this study were to determine if there were relationships between:

1. Physical size, and (a) personal adjustment, (b) social adjustment, and (c) total adjustment.
2. Athletic ability, and (a) personal adjustment, (b) social adjustment, and (c) total adjustment.
3. Acceptance by peers, and (a) personal adjustment, (b) social adjustment, and (c) total adjustment.
4. Acceptance of peers, and (a) personal adjustment, (b) social adjustment, and (c) total adjustment.

Procedure

The group studied was five sections of a seventh grade class in West Monroe, Louisiana, which included seventy-two boys and fifty-eight girls. The age of this group ranged from eleven years to thirteen years; the mode of the group was twelve years.

Each of the 130 boys and girls was given tests to measure the variables used in this study. Physical size in this study was determined by combining T-scores from height and weight into one physical size T-score.

Athletic ability was determined by T-scores from the following skill tests combined into one T-score: softball distance throw, fifty-yard dash, basketball wall bounce, and standing broad jump.

Acceptance by peers and acceptance of peers were determined by Cunningham's Social Distance Scale.

Personal, social, and total adjustment were determined by The California Test of Personality and the Rogers Test of Personality Adjustment.

The specific hypotheses to be tested in this study were:

1. Boys and girls with the larger T-scores in physical size receive better scores on personal, social, and total adjustment than boys and girls with low T-scores in physical size.
2. Boys and girls who receive the better athletic ability T-scores receive better scores on personal, social, and total adjustment than boys and girls with the lower athletic ability T-scores.
3. Boys and girls who receive the better scores on Cunningham's Social Distance Scale in acceptance by peers (Group Social Distance) receive better scores on personal, social, and total adjustment than boys and girls who receive the poorer scores on Cunningham's Social Distance Scale.
4. Boys and girls who receive the better scores on Cunningham's Social Distance Scale in acceptance of peers (Self Social Distance) receive better scores on personal, social, and total adjustment than boys and girls who receive the poorer scores on Cunningham's Social Distance Scale.

5. Girls in this study receive better scores on personal, social, and total adjustment than boys.

In testing hypotheses one through four data collected on boys and girls were kept separate and correlations were computed on the variables.

Hypothesis five was tested by computing the significant difference between the means of boys' scores and girls' scores.

Findings

There were no significant relationships found in correlating Rogers Test of Personality and variables in this study. Likewise, there were no significant relationships found between correlations of boys' physical size and The California Test of Personality. A significant relationship was found between girls' physical size and the personal adjustment component of The California Test of Personality.

Boys' athletic ability and components of The California Test of Personality indicated there were no significant relationships between these variables. Girls' athletic ability and components of The California Test of Personality indicated there was not a significant relationship between these variables; however, there was a trend in the direction of a significant relationship between girls' athletic ability and personal and total adjustment.

As for acceptance by peers and components of The California Test of Personality, there was a significant relationship found on all components except the social adjustment section for boys.

A significant relationship was found between acceptance of peers and social adjustment for both boys and girls.

Microfilm \$2.50; Xerox \$6.60. 138 pages.

CONCEPTS OF THE ROLE OF SECONDARY SCHOOL COUNSELORS

(L. C. Card No. Mic 59-6384)

Lyle Darrel Schmidt, Ph.D.
University of Missouri, 1959

Supervisor: Paul C. Polmantier

PURPOSE: To identify and compare concepts of the actual and ideal roles of secondary school counselors as they are held by secondary school counselors and by their secondary school principals.

METHOD OF RESEARCH: A structured sample of fifty statements of counselor responsibilities was made from a universe of possible responsibilities of secondary school counselors. These statements were studied by three judges and worded to be as descriptive and unequivocal as possible. When entered on small cards they composed a Q-sort of counselor role.

From an official listing, all counselors in Missouri public secondary schools were identified who held the Professional or Teacher-Counselor, Missouri guidance certificate. Using certain criteria, those from this group were selected who were essentially full-time counselors, who had been counselors at least two years,

and who did not bear primary administrative duties. Twenty-four urban counselors, twenty-four non-urban counselors, and the principal from each of their schools composed the final subject population.

Each subject was personally visited and asked to make two arrangements of the Q-sort statements. The cards were to be sorted into nine columns from most like to least like the role being considered. Each counselor sorted them according to (a) what he was presently doing as counselor; and (b) what he believed he should ideally do as counselor. Each principal sorted them according to (a) what the counselor in his school was presently doing as counselor; and (b) what he believed the counselor in his school should ideally do as counselor. Each subject also completed an information form.

The data were analyzed by first weighting each statement according to its placement in each sorting. The different sortings were then correlated and the average correlations (using Fisher-z) of the participating groups evaluated. Finally, responsibilities most like and least like the different counselor role concepts were identified by means of cumulative weights.

CONCLUSIONS: Insofar as the participating subjects might be considered similar to others in like schools in Missouri and elsewhere, the following conclusions seem warranted:

- (1) Both secondary school counselors and their principals tend, on the average, to perceive a substantial positive relationship between the actual and ideal roles of the counselors (counselors, $r = .74$; principals, $r = .75$).
- (2) Counselors do not perceive a greater similarity between the actual and ideal roles than do principals.
- (3) The relationship between the counselors' and principals' perceptions of the counselor's actual role is on the average, positive but limited ($r = .60$).
- (4) The relationship between the counselors' and principals' perceptions of the counselor's ideal role is on the average, positive but limited ($r = .60$).
- (5) Although far more principals than counselors declared themselves to be satisfied with their guidance program, the use of Q-technique in this study reveals less divergence in satisfaction than the declarations indicate.
- (6) Counselors actually and ideally tend to consider vocational and educational counseling, personal and social counseling, interpreting test results, and interviewing teacher-referred students to be their major responsibilities, while considering attendance keeping, audio-visual supervision, and research on classroom tests as not being their responsibilities. Ideally they tend to believe that they should do more on identifying exceptional students, but that they should not prepare transcripts.
- (7) Principals actually and ideally tend to consider vocational and educational counseling, personal

and social counseling, interpreting test results, maintaining occupational and educational information, and identifying exceptional students as major responsibilities of counselors. On the average they do not, nor ideally would not, consider the counselor as the person to keep attendance, supervise audio-visual programs or substitute for the principal in his absence.

Microfilm \$2.50; Xerox \$7.60. 164 pages.

AN ANALYSIS OF THE SENTENCE COMPOSITIONS OF LIKED AND DISLIKED TEACHERS

(L. C. Card No. Mic 60-603)

John Adam Schmitt, Ed.D.
Cornell University, 1959

The purpose of this investigation was to determine the potential of the Sentence Composition Test (SCT) for providing material related to teachers' achieved degree of rapport. The study was restricted to the junior-high-school level, and as the SCT was employed here, teachers were provided with sheets of ruled paper and were instructed to compose twenty sentences containing the word because. The ultimate goal was the development of knowledge which would contribute to the prediction of teacher-success in classroom interpersonal relations.

Procedures

Data were collected in five rural schools of upper New York State, and the limitations encountered with samples of volunteer subjects were avoided by obtaining principals' agreements to the participation of faculties and pupils. The SCT was administered to fifty-five junior-high-school teachers in these schools, and pupil-ratings on a twenty-item scale were used as the indices of rapport for criterion purposes.

With mean pupil-ratings providing the basis, the sentence compositions of the highest and lowest twenty per cent of the sample were submitted to analysis in terms of seventy-four elements, including Murrayian Needs and Press, cathexes, subject-orientation, temporal orientation, verbosity, anxiety expressions, and the incidences of several parts of speech. Fourteen of these elements appeared to show promise for effecting the desired discrimination in this preliminary analysis, and these were tabulated in the remaining sentence compositions. The entire sample was then dichotomized by every incidence of each of these elements that would assign at least ten subjects to each segment, and the t-test was applied to determine the significance of the discriminations effected thereby.

Findings

The rating scale developed as a criterion instrument was found to be very satisfactory. Its items had been derived primarily from aspects of teacher-behavior previously found to be influential in determining pupils' attitudes toward teachers, and the mean ratings demonstrated reliability above .90, when based on individual ratings by

ten or more pupils. Adequacy of range, effective discrimination, objectivity and provision for oral administration were additional advantages.

With the .05 level of confidence accepted as significant, it was determined that the occurrence of two or more sentences in which activities or ideas were positively cathected was significantly related to higher pupil-ratings, and that the same was true for the occurrence of three or more sentences in which activities or ideas were negatively cathected. Use of these two elements, separately and in combination, to dichotomize and trichotomize the sample yielded corrected point serial correlation coefficients from .35 to .47, and no relationship was demonstrable between sex, age, marital status or extent of previous teaching experience and the tendency to produce these critical incidences of the two elements.

Conclusions

Although two sentence-composition elements were found to be significantly related to pupil-ratings, consideration for the relatively large number of elements tested dilutes the confidence that these findings presently merit. Verification is essential prior to any attempt at practical application, and furthermore, unless additional elements with capacity for discriminating between liked and disliked teachers can be discovered, the Sentence Composition Test--whatever its potential in other areas--appears to offer little practical promise as a psychometric tool in the field of teaching prognosis. It is the investigator's hope, however, that this instrument will not be dismissed from this area of endeavor without further efforts to discover such additional elements.

Microfilm \$2.50; Xerox \$8.00. 174 pages.

AN INVESTIGATION OF THE DEVELOPMENT OF READING ACHIEVEMENT GROWTH FROM GRADES FOUR TO NINE

(L. C. Card No. Mic 59-6230)

Florence Vogel Shankman, Ed.D.
New York University, 1959

Statement of Problem

The general purpose of this study is to investigate and analyze the reading achievement of ninth grade students that has taken place from grades four to nine, to determine if there are any significant differences in the amount of reading achievement growth from year to year and to find the relationship between this achievement growth and the variables of sex, intelligence, language, and spelling achievement.

Significance of Problem

The literature indicated that there is a need for longitudinal studies of reading achievement, particularly for the intermediate grades. The existing studies are few in number and are based only upon cross-sections of population, so do not give a true picture of child development over a period of years. The present study utilizes

standardized test results to help identify superior or retarded individuals. Since this investigation compares the achievement of students in the elementary grades with those in the junior high school, in reading, language (mechanics of grammar and spelling), and spelling achievement, it reveals significant factors for curriculum planning and guidance in the classroom.

Previous Research

The previous literature indicated the wide range and variability of reading achievement at each grade level; however it did not diagnose reading achievement accurately because of a lack of cumulative test results over a long period of time for the same group of individuals. The factors influencing reading achievement were found to be complex. More reading problems were found among boys than among girls in the primary grades, but the differences between the sexes disappeared by the time they reached the secondary level. A high relationship was found between reading achievement and intelligence, but this often fluctuated as other factors were taken into consideration.

Procedure in Collecting Data

The population consisted of 347 ninth grade students (167 boys and 180 girls) from the public schools of Norwalk, Connecticut. Information was obtained from the school permanent record cards with reference to family background, intelligence level and yearly grade level scores in reading, language and spelling as determined from the California Achievement Tests given by the classroom teacher, each year from grades four to nine. Additional information was listed by the investigator with reference to age, sibling placement, parent's occupation and course chosen for high school, and was used in studying individual cases which deviated more than two standard deviations from the mean. Correlations were found between reading achievement and the variables of sex, intelligence, language, and spelling achievement in the elementary school and in the junior high school. Analysis of variance was used to determine whether or not there were any significant differences among the means of the yearly total reading test scores, and to find the interaction of the factors of sex, intelligence and grade when comparing the students of the elementary grades with the junior high school grades in reading achievement.

Results and Conclusions

There were significant differences in reading achievement from year to year from grades four to nine, but there were no significant differences between the sexes. Intelligence had a low but positive relationship to reading achievement as indicated by the correlation of .36 for boys, and .34 for girls. There was a higher, more substantial relationship between reading and language than between reading and intelligence, as shown by the correlation of .59 for girls and .51 for boys in language. Reading and spelling had a higher relationship in the elementary school than in the junior high school, but not as high a relationship as was found between reading and language. There was a negative correlation between reading achievement in the junior high school and reading achievement in the elementary school indicating a leveling off process.

Parental occupation, sibling placement or the course chosen for high school were not significant in reference to reading achievement.

Microfilm \$2.50; Xerox \$7.80. 169 pages.

ABBREVIATED WECHSLER-BELLEVUE INTELLIGENCE SCALES WITH A SELECT HIGH SCHOOL POPULATION

(L. C. Card No. Mic 60-625)

Jeanne Baker Smith, Ph.D.
Bradley University, 1959

The objective of this study is to determine whether a short form of the Wechsler-Bellevue Intelligence Scale might be satisfactory in determining the I.Q. level of disturbed pupils of high school age.

A population of 798 subjects was selected from the records of the Bureau of Child Study of the Chicago Public Schools. From these data a zero order of correlations utilizing the Full Scale I.Q. as criterion was obtained, as well as the intercorrelations of each of the 10 subtests.

The Square Root Method⁶² was used to obtain the multiple correlations for an increasing number of combinations of subtests. On the basis of these multiple correlations a short form of the Wechsler-Bellevue was arrived at which is composed of Information, Similarities, Picture Arrangement, Block Design, whose correlation with the full length Wechsler-Bellevue was .93. With the addition of a fifth or sixth test, the multiple correlation was increased only by .01 of an I.Q. point which was judged to be an insignificant increase in view of the increased time required for the administration of the longer test.

In order to check the results, another sample of 122 subjects from the same type of population, but not of the original 798 population, was selected. With this group, the correlation of the short form Information, Similarities, Picture Arrangement, Block Design with the full length Wechsler-Bellevue test was .94. In view of the reliability coefficient of the long form of .94, the short form derived seems to be an adequate measure of the intelligence of a population such as that of this study.

On the basis of this study the use of a short form of the Wechsler-Bellevue composed of Information, Similarities, Picture Arrangement, Block Design appears to be an adequate measure of intelligence for a population similar to the population used in this study.

The population of this study was composed of disturbed high school age pupils and no claim is made for the utilization of the short form proposed with any other population.

Further study is needed to determine the adequacy of the short form herein proposed with any other population.

Microfilm \$2.50; Xerox \$3.00. 53 pages.

62. A. Summerfield and A. Lubin, "A Square Root Method of Selecting a Minimum Set of Variables in Multiple Regression," *Psychometrika*, 1951, XVI, 425-427.

**WOMEN STUDENT LEADERS AT
NORTHWESTERN UNIVERSITY: THEIR
CHARACTERISTICS, SELF-CONCEPTS,
AND ATTITUDES TOWARD THE UNIVERSITY.**

(L. C. Card No. Mic 60-457)

Patricia Ann Thrash, Ph.D.
Northwestern University, 1959

Adviser: Frank W. Miller

The purpose of this study was to discover the characteristics of a selected group of women student leaders at Northwestern University during the academic year 1957-1958, to examine their self-concepts, and to determine their attitudes toward the university.

The sixty subjects included twenty-three seniors, twenty-seven juniors, six sophomores, and four freshmen who had been elected to positions of leadership and honor by their peers. The seniors were members of Mortar Board, national senior women's honorary society, and Shi-Ai, Northwestern University honorary society for junior and senior women. The juniors were members of Shi-Ai. The sophomores and freshmen were presidents of their living groups or groups limited to women in the freshman and sophomore classes.

A descriptive approach was employed. Standardized tests used were the Otis Self-Administering Test of Mental Ability, Higher Examination; the Guilford-Zimmerman Temperament Survey; the Kuder Preference Record, Vocational Form C; and the Allport-Vernon-Lindzey Study of Values. Instruments were constructed by the experimenter to obtain the leaders' self-concepts and their attitudes toward the university. Data from these sources were supplemented by information from university personnel records and personal interviews.

These were the findings of the study:

First, the leaders registered superior intelligence on the Otis Self-Administering Test of Mental Ability, Higher Examination. This intelligence was reflected in the superior academic averages of the leaders.

Second, in the area of leadership, a substantial number of leaders received most favorable scores in terms of supervisory promise as set forth by the authors of the Guilford-Zimmerman Temperament Survey in these areas: emotional stability, friendliness, and thoughtfulness. More than half the leaders achieved most favorable scores in the areas of general activity, ascendancy, personal relations, and femininity. One-third of the leaders received most favorable scores in the area of restraint.

Third, on the Kuder-Preference Record, Vocational Form C, the leaders evidenced significant interest in the literary area and substantial interest in the persuasive, musical, social service, and artistic areas. They showed little interest in the clerical, mechanical, computational, and scientific areas.

Fourth, in their self-descriptions and personal philosophies, the leaders expressed values which had no direct and significant relationship to their pattern of scores on the Allport-Vernon-Lindzey Study of Values. Major values expressed by the leaders were a realistic self-awareness and self-acceptance; a genuine acceptance of and love for others; faith in God; and a sense of commitment. Highest values of the leaders on the Study of Values were in the theoretical, aesthetic, and religious areas. The leaders

possessed average political values, below average social values, and low economic values.

Fifth, in their description of the university climate, the leaders suggested that students, faculty, and administration create the climate. The leaders described the climate as both conforming and creative, both social and intellectual in emphasis.

The majority of the leaders observed that their needs had been met in the areas of physical health, intellectual growth, social growth, and spiritual growth. The experiences which the leaders felt contributed the most to their personal growth were group living with those of different backgrounds and interests, leadership responsibilities, overcoming personal disappointments, friendships, activities, and a stronger religious faith.

The leaders offered specific suggestions for the improvement of the university climate in the intellectual and social areas.

Microfilm \$2.50; Xerox \$8.20. 180 pages.

**THE IDENTIFICATION OF THE PROBLEMS OF
JUNIOR HIGH SCHOOL YOUTHS AND THE
DETERMINATION OF THE RELATIVE
STABILITY OF THESE PROBLEMS.**

(Volumes I and II).

(L. C. Card No. Mic 60-626)

Theresa Eleanor Trifari, Ed.D.
Boston University School of Education, 1959

Problem: To identify the problems and problem-burdens of junior-high school youths and to determine the relative stability of these problems, by grade, by sex, and by intelligence quotient over three time intervals, as revealed by administration of the Billett-Starr Youth Problems Inventory (Junior Level).

Scope and Limitations of the Study: The Billett-Starr Youth Problems Inventory (Junior Level), a new comprehensive instrument, was administered twice, at three different time intervals, to each pupil in grades 7, 8, and 9 of a junior-high school located near Boston. The majority of the students came from homes representative of a middle-class cross section of the population. Stability was determined by those items that were checked by the pupils again after a time interval.

Procedure: A conference was held with the school faculty to prepare and organize the administration. The inventory was administered first to all the pupils on November 6, 1956. The 549 pupils were divided, randomly, into three nearly equal groups for the three parts of the second administration. The intelligence-quotient-group consisted of 108 pupils, 54 with the highest intelligence quotients and 54 with the lowest intelligence quotients.

The second administration took place for the first group sixty days, for the second group 120 days and for the third group 180 days after the first administration.

The results of the inventory were recorded and compared on the basis of grade, sex and intelligence quotients. The items of statistical significance were computed by using critical ratios.

Major Findings and Conclusions:

1. On the first administration the pupils of the selected junior high school had a problem-burden of 13 per cent which is higher than the norm of the inventory of 10 per cent.
2. These pupils had a problem-burden lower than the norm of 10 per cent on the second administration (8 per cent).
3. Grade 9 had the greatest problem-burden in both administrations irrespective of the time interval.
4. The problem frequency of mention increased slightly for all grades between each interval.
5. The girls had a slightly higher problem-burden than the boys.
6. The pupils of the low intelligence group had a greater problem-burden in both administrations than the high intelligence group.
7. A total of 8,385 new items was checked for the first time in the second administration including all time intervals.
8. The girls checked more new items than the boys.
9. The low group checked more new problems than the high group.
10. Area III Boy-Girl Relationships had the greatest percentage frequency of mention.
11. Area IX Planning for the Future had the least percentage frequency of mention.
12. The number of items with stability of 50 per cent or over was greatest in the 60-day group. Each succeeding interval showed slight decreases, grade 8 excepted.
13. Grade 9 had the greatest measure of stability (34 per cent); grade 7, next (27 per cent); and grade 8, the least (18 per cent).
14. The girls had a greater measure of stability than the boys in two of the time intervals; 60-day and 120-day.
15. The pupils of the high group had a slightly greater measure of stability than the low group.
16. The greatest stability was in Area IV Home and Family Life and Area VII School Life for the girls and Area I Physical Health, Fitness, and Safety for the boys.
17. The measure of stability may be utilized as an indicator of stable and transitory problems.

Microfilm \$14.20; Xerox \$52.70. 1126 pages.

**A STUDY OF THE RELATIONSHIP OF
EVALUATIVE ATTITUDES TO SCHOLASTIC
ABILITY AND ACADEMIC ACHIEVEMENT**

(L. C. Card No. Mic 60-805)

Paul Lewis Ward, Ph.D.
The Ohio State University, 1959

The problem of this investigation was to discover the relationship of evaluative attitudes to divergent levels of scholastic ability and academic achievement among 136 female college freshman students at the Ohio State University.

Evaluative attitudes in this study is a construct under which is subsumed values, interests, and manifest needs. Six null hypotheses were established in which it is assumed that there are no significant differences in (1) the values of high and low ability students, (2) the interests of high and low ability students, (3) the manifest needs of high and low ability students, (4) the values of high and low achieving students, (5) the interests of high and low achieving students, and (6) the manifest needs of high and low achieving students.

Four samples were selected and tested, viz., a low ability group (N = 34), a high ability group (N = 44), a low achieving group (N = 29), and a high achieving group (N = 29).

The instruments employed to measure values, interests, and needs were the Allport-Vernon-Lindzey Study of Values, the Kuder Preference Record, Personal, and the Edwards Personal Preference Schedule. The t test was applied to determine the significance of the differences of means for the four samples in terms of values, interests, and manifest needs. Both the .01 and the .05 confidence limits were accepted.

The major findings of the investigation were as follows:

1. Low ability students expressed significantly (.05) higher economic values while high ability students expressed significantly (.01) higher aesthetic values.
2. The high ability students scored significantly (.01) higher than the low ability students on items which deal with preference for working with ideas.
3. High ability students expressed significantly (.05) higher need to achieve in activities which they undertake. Low ability students expressed significantly (.01) higher need to obtain suggestions and/or reassurance from others.
4. Low achieving students scored significantly (.05) higher on economic values, and high achieving students scored significantly (.05) higher on aesthetic values.
5. High achieving students expressed higher preference for working with ideas, and low achieving students expressed higher interest in familiar and stable situations. These were significant at the .05 per cent level of confidence.
6. High achieving students were characterized by higher need to achieve in tasks which they undertake. This difference was significant at the .05 per cent level.

These findings suggest that generalizations concerning students' evaluative attitudes should be made with caution. The various groups of students in this study are characterized by particular values, interests, and needs. It would be well for colleges to investigate the attitudes

germane to their particular student populations prior to initiating new or modifying existing instructional and counseling practices. It is suggested that ability grouping may be supplemented by grouping in terms of attitudes in order to render instruction and counseling more effective at the college level. Also, both long-range and more intensive investigations into the relationship of attitudes to learning and adjustment are needed.

Microfilm \$2.50; Xerox \$7.60. 163 pages.

THE IDENTIFICATION OF POTENTIALLY MALADJUSTED CHILDREN IN THE MIDDLE ELEMENTARY GRADES

(L. C. Card No. Mic 59-2803)

Kenneth Conrad Weisbrod, Ed.D.
University of Maryland, 1958

Supervisor: Professor Madelaine Mershon

Purpose:

This project is to determine to what extent certain information available to teachers in their day-to-day contact with pupils could be used by them to identify potentially emotionally maladjusted children in the fourth, fifth and sixth grades. A further purpose is to develop an actuary method of identification suitable for teacher use with the entire class without the aid of psychological or psychiatric assistance.

Procedure:

Clinicians were asked to identify children enrolled in regular fourth, fifth, and sixth grade classes who, in their estimation, were emotionally disturbed. Two hundred classes, in which clinically designated children were enrolled, were identified and their teachers were asked to gather data on each child in the class with reference to multiple criteria related to the school setting. Information was gathered by the teachers during the school year 1954-1955 and included the following:

1. Scores on group administered intelligence tests.
2. Scores on arithmetic and reading achievement tests.
3. Scores on Thinking About Yourself, a personality inventory distributed by the California State Department of Education.
4. Scores on The Class Play, a projective sociogram distributed by the California State Department of Education.
5. The number of days of absence reported for each child.
6. Age-grade relationship.
7. Socio-economic status of the family as indicated by father's occupation.
8. Rating by teacher of the physical status of each child.
9. Rating by teacher of the adjustment status of each child.

All instruments were administered and scored as prescribed by the authors. Each of the above factors was analyzed and weights assigned to those having the capacity to discriminate between the clinically designated children and their classmates. Factors showing the highest discriminatory quality were used to develop an actuary method by which teachers might identify disturbed children in the classroom. Those children in the class who deviated markedly on the total product factor or in a pattern making up the total product factor were believed to be potentially emotionally maladjusted.

Findings:

1. Intelligence: Maladjusted children deviate significantly from their classmates on results of group administered intelligence tests.
2. Achievement: Maladjusted children scores significantly below their classmates in both reading and arithmetic. Greater differences existed between the two groups in arithmetic than in reading. Differences between the two groups tended to increase from the fourth through the sixth grade.
3. Self perception: A significant difference was found between the maladjusted and other boys in the extent of discrepancy between the perceived self and the wished for self. Greater discrepancies were found among maladjusted boys. Owing to a limitation in the instrument, no significant difference was found for maladjusted girls and other girls in their class.
4. Peer ratings: Maladjusted children were perceived negatively by their peers while other children in the classes were generally seen positively. Differences in the ratings of the two groups were found to be significant.
5. Absence from school: Differences in rate of absence between maladjusted children and their classmates were not found to be significant.
6. Age-grade relationship: There was no significant age-grade difference found between the maladjusted and other children.
7. Socio-economic status of the family: No significant socio-economic differences were found between the maladjusted and other children.
8. Rating by teacher of physical status of each child: This factor failed to discriminate between maladjusted children and their classmates.
9. Ratings by teachers of adjustment status of each child: Teachers and clinicians tended to identify the same children as maladjusted. Teachers identified 4.4 per cent of all children and 26 per cent of the maladjusted as aggressive or defiant. Teachers rated 61 per cent of the emotionally maladjusted group (N-207) overly aggressive or defiant either "quite often" or "most of the time." Teachers indicated twice as many boys as girls in the total group to be overly aggressive "most of the time." Seven boys to one girl in the group of maladjusted children were so rated by teachers. In the maladjusted group, 25 per cent were rated overly withdrawn "quite often" or "most of the time."

Finding the factors of intelligence, achievement, peer rating and teacher rating to differentiate significantly between the maladjusted and other children in the fourth, fifth, and sixth grades, these factors were used for the purpose of this study.

Microfilm \$2.50; Xerox \$5.60. 114 pages.

**GUIDANCE SERVICES IN
BLOOMFIELD, NEW JERSEY, PUBLIC
SCHOOLS, 1925 THROUGH 1958.**

(L. C. Card No. Mic 59-5332)

Leslie Herbert Willis, Ed.D.
Rutgers University, 1959

Problem. Investigation and interpretation of the historical development of organized guidance services in the Bloomfield, New Jersey, Public Schools from 1925 through 1958.

Importance. Value for the school system in promoting further understanding of the past, present, and future of its guidance services.

Procedures. Traditional to historical research making use of annual reports, minutes of committees, guidance program materials, and individual pupil personnel records; normative-survey with chief technique a questionnaire; analysis of a one hundred-eighty case sampling of Child Guidance Department studies.

Conclusions: Senior High School. The guidance program from its beginnings to the present centered in educational and vocational counseling which met most adequately the needs of the college-bound student.

Although the program as conceived and operative was rated as excellent by evaluating committees of the Middle Atlantic States Association, it nevertheless had certain deficiencies. For example, a weakness of the high school program was the absence of formal procedures for follow-up to provide information for curriculum revision, and to assist the drop-out student or the general course graduate.

Conclusions: Junior High School. The program had clearly defined areas of operation stemming from an evaluational job-analysis by the counseling staff and was carried out most extensively in the areas of articulation and subject-selection counseling.

Junior High School teachers indicated a strong need for additional in-service training and an improvement or implementation of the procedures involving the referral of pupils for guidance services.

Problems of articulation between ninth and tenth grade arose because of a wide difference in program concept. Curricular experimentation with selected groups conflicted with the fixed sequence of courses at the next level. Resolution of these problems by guidance personnel was mainly in terms of program mechanics.

Conclusions: All school levels. The program concept for the Child Guidance Department was broader from the outset to the present than possible of achievement by the

limited staff assigned. It was further concluded that reorganization of the Child Guidance Department was critically needed from the fact of the tremendous growth of and demand for services in three areas: special services to individual pupils, coordination of the thirteen-year guidance program, and responsibilities in the group test program. Professional staff comment in questionnaire response indicated need for additional psychologists.

The acceptance of the Visiting Teacher as an important guidance worker and the limited availability of this worker for social casework led to the conclusion that there was additional staff need in this area.

There was excellent acceptance and support of guidance services among the professional staff at all school levels in Bloomfield. Neither the factor of training in the field of guidance and personnel nor of experience in the district made any substantial difference in the response of the professional staff as classified by the factor.

Recommendations for local study. Additional study of the total pupil personnel services structure in this school system is needed.

Parent and pupil response to the extent and effect of guidance services should be secured to supplement conclusions drawn from the staff response secured as part of this study.

The implications of within-system promotion or transfer of trained guidance workers for recruitment policy should be examined.

Analysis of the exact costs of the total guidance program is a definite need especially in connection with the rapidly expanding group test program.

Recommendations for general study. Long-term growth and development of guidance services in other New Jersey school systems.

The relationship of psychological services to guidance department activity in selected communities.

The duties and responsibilities of the school social worker in New Jersey with special reference to emerging identification as a guidance worker.

Microfilm \$5.40; Xerox \$19.15. 424 pages.

**GROUP GUIDANCE PRACTICES IN SELECTED
NEW JERSEY SENIOR HIGH SCHOOLS**

(L. C. Card No. Mic 59-5333)

Harvey J. Yogman, Ed.D.
Rutgers University, 1959

Problem

The design of this study was to identify group guidance practices in current use in fifty-three New Jersey senior high schools. The study solicited expressions of opinions from both guidance functionaries and pupils as to their reactions to their respective programs.

The study was limited to high schools having an enrollment of at least 1,000 students, distributed indiscriminately throughout the state. Urban and rural communities were represented.

Procedures

The guidance functionary in charge of the program at each of the schools was requested to complete a specially-designed questionnaire on the nature and effectiveness of his respective group guidance program. Students selected at random were requested to fill in checklists which would provide information about the operation of the group guidance program at their school as well as to indicate their reactions to the program.

A total of forty-nine questionnaires was completed by the guidance personnel and 3,286 checklists by the students. As a follow-up procedure, some 341 students were personally interviewed by the writer.

A review of all pertinent literature was made and all schools in the study were visited.

CONCLUSIONS

The schools in the study tended to place their emphasis on the needs of the more promising students while giving less attention to non-academically oriented students.

Students are most receptive to and influenced by programs which deal in specific terms with problems of immediate concern to them, such as first entry jobs, college admissions.

Areas of common concern to most students of a given grade level in a given school can be handled effectively through the group guidance approach. However, personal adjustment problems not strictly of the educational or vocational type may be handled better in an individual counseling situation than in a group setting.

In general, suburban communities where there was considerable community participation as well as adequate financing of school activities seemed to have more intensive and comprehensive group guidance programs.

A need exists for the high schools themselves to assess their group guidance practices.

Microfilm \$2.50; Xerox \$7.20. 155 pages.

THE EFFECTS OF CLASS ORGANIZATION AND TIME ON THE TEACHER'S ABILITY TO CLASSIFY HIS PUPILS WITH RESPECT TO THREE GENERAL PERSONALITY TRAITS

(L. C. Card No. Mic 59-6592)

Ernest E. Yunghans, Ed.D.
Indiana University, 1959

Chairman: Louis G. Schmidt

The problem which initiated this research emerged from the rather unique situation in the Lutheran elementary school system which finds the vast majority of schools containing multigrade classrooms.

A frequent claim made in defense of the small multigrade school is that the multigrade teacher learns to know his pupils better than does the teacher of a single-grade classroom.

This experiment was designed to test the hypothesis that the teacher of a multigrade classroom knows his pupils better with respect to general personality traits than does the teacher of a single-grade classroom. Three subsidiary hypotheses supporting the major hypothesis

were tested. They were, first, that the multigrade teacher can more accurately classify his pupils with respect to general personality traits than can the single-grade teacher; second, that the multigrade teacher is more consistent in his classifications than the single-grade teacher; and third, that the accuracy of the teacher's classification increases with the number of years spent with the pupils. The three personality traits considered were personal and social adjustment as defined and measured by the California Test of Personality and Christian attitude as defined and measured by the Attitude Inventory.

Twenty-seven single-grade teachers and 31 multigrade teachers chosen at random from rooms containing grades five through eight in the Lutheran elementary schools of six Midwestern states twice rated their children on the three traits within 14 days. Immediately following the first rating and before undertaking the second, these teachers administered the two standardized tests. Another group of 19 single-grade and 19 multigrade teachers were similarly chosen but completed only the two ratings, administering no standardized tests. This second group, designated as non-test teachers, was employed to check consistency of ratings in the absence of test information.

Analysis of the obtained data involved testing a series of null hypotheses to determine whether or not true differences existed between the single-grade teachers and multigrade teachers with respect to accuracy and consistency of rating when they were compared as groups. To measure the effect of time on the accuracy of rating, the pupils were divided into three time groups, corresponding to approximately one, two, or three academic years. The percentages of correct judgments made by the teachers as compared with the criteria were computed and compared. The observed differences among the time groups were tested for significance.

No differences significant at the .05 level of confidence were obtained between the single-grade and multigrade teachers with respect to the accuracy of their ratings on any of the three general traits. No differences significant at the .05 level were observed between the single-grade and multigrade teachers of the test group with respect to the consistency of their ratings on the three traits. No differences significant at the .05 level were observed between the single-grade and multigrade teachers of the non-test group with respect to the consistency of their ratings on personal adjustment and Christian attitude. A difference significant at the .05 level was observed in the non-test group with respect to the consistency of rating on social adjustment, but this difference favored the single-grade not the multigrade teachers. In the cases of all three traits no trends were observed which would indicate that the accuracy of the teachers' judgments increased with the number of years spent with the pupils. None of the differences observed among the several time groups was significant at the .05 level.

Given the present sample and procedure, and in view of the presently obtained data, the following conclusions were drawn.

1. Multigrade teachers were no more accurate than single-grade teachers in classifying their pupils with respect to the three general personality traits, personal adjustment, social adjustment, and Christian attitude. This conclusion refuted the first subsidiary hypothesis.

2. Multigrade teachers were no more consistent than single-grade teachers in classifying their pupils with

respect to the three general personality traits, regardless of whether or not personality tests were administered between the two ratings. This refuted the second subsidiary hypothesis.

3. Time, when considered in intervals of an academic year, had no effect in increasing the accuracy of the teacher in classifying his pupils with respect to the three general traits after the teacher had worked with the class for at least eight months. This refuted the third subsidiary hypothesis.

4. In view of the present data, one could not maintain that the teacher of a multigrade classroom knows his pupils better with respect to general personality traits than does the teacher of a single-grade classroom. Consequently, the major hypothesis was refuted.

Research should continue on the effectiveness of multigrade teaching as compared with single-grade teaching especially with regard to its effects on the personality development of the child. The problem might well be investigated by means of experiments employing a different rating technique as well as different criteria, preferably the judgments of clinicians. The effect of time on the teacher's ability to judge his pupils personalities should be studied possibly at monthly intervals during his first year's experience with the class.

Microfilm \$2.50; Xerox \$5.80. 116 pages.

EDUCATION, RELIGION

A STUDY OF DIRECTORS OF CHRISTIAN EDUCATION IN CHURCHES OF THE DISCIPLES OF CHRIST IN THE UNITED STATES

(L. C. Card No. Mic 60-700)

Gentry Allen Shelton, Ed.D.
University of Kentucky, 1954

The Problem

The problems involved in this study will be to determine areas wherein the directors of Christian Education in Disciples of Christ churches are lacking in professional training and to make specific recommendations to help remedy this situation so that in the future, young people in preparation for professional service may benefit.

The Purpose of the Study

The purposes of this study are:

1. To determine the nature of the preparatory program needed for professional directors of Christian education among the communion known as the Disciples of Christ.
2. To show the rise and growth of the position of director of Christian education among the Disciples of Christ in the United States.
3. To show the present status of those persons holding the position of directors of Christian Education among churches of the Disciples of Christ.

Procedures

The major source for this investigation was a questionnaire sent to all persons holding the title of director of Christian education, or having the responsibility for the program of Christian education in the churches of the Disciples of Christ. Personal interviews and correspondence were used as supplementary means of securing information.

The Questionnaire

The questionnaire used in securing the information presented in the study was prepared by the writer especially for the purpose of conducting this investigation. It was accompanied by a letter which explained the nature of the investigation and asked directors of Christian education to supply the desired information.

Section I of the questionnaire, "General Information", contained requests for information concerning the size of churches served, size of staff, clerical help, the person or persons to whom the director is responsible, and by whom he is employed. A question regarding the nature of his contract was also asked.

Section II dealt with personal information such as age, marital status, salary, other increments, length of service, other professional service, vacation time, minister's salary, minister's increments, vacation time, and time off for special work.

Section III dealt with the preparatory program of the director, other contributing factors, recommendations for future preparation, suggestions relative to continued preparation for those in the field, and the academic work of the ministers.

Section IV sought information concerning the specific responsibilities of directors of religious education, their likes, dislikes, gratifying areas, curriculum, administration, status, work load, problems and evaluations.

Collection of Data

The questionnaires were sent to 291 persons listed as directors of religious education in the office of Church School Administration of the Division of Christian Education of the United Christian Missionary Society in Indianapolis, Indiana.

The Status of the Director of Religious Education

Data indicate that the larger percentage of education workers in Disciple churches (54 per cent) serve churches from 750 to 1500 members, and that men directors serve larger churches than do women directors.

The largest number of persons serving as Disciple directors, with previous experience in areas other than religious education, are public school and college teachers. Although many previous professions are represented, the present status of the director of religious education is made stronger by the inclusion of these former teachers.

A Study of the Preparation Programs for Directors of Religious Education in Disciples of Christ Churches

The writer noted that interviewees who possessed a broad educational background, such as secular education

or the liberal arts, with graduate work in religious education, seemed to have more of a sense of perception of the total task than did those who have had background in religious subjects only. The former interviewees were more positive in their evaluations of their preparatory programs and of their work than were the latter group. While this does not necessarily indicate weakness in the preparatory programs of the directors with work only in religion or religious education, it does seem to point out that the broader educational experiences are most valuable.

The Director and His Responsibilities

If the predictions of many of the outstanding religious educators and leaders of the Disciples of Christ communion hold true, and the writer has every reason to believe that they will, the future of the profession of director of religious education seems assured for many years to come. At the present time, there are from five to six calls for every trained, available worker.

Microfilm \$3.05; Xerox \$10.60. 235 pages.

EDUCATION, TEACHER TRAINING

SOME BACKGROUND FACTORS, MOTIVATION FACTORS AND FUTURE PROFESSIONAL PLANS OF STUDENT TEACHERS IN STATE-SUPPORTED TEACHER TRAINING INSTITUTIONS IN MISSOURI.

(L. C. Card No. Mic 59-6349)

Wilmer Winfield Aldrich, Ed.D.
University of Missouri, 1959

Supervisor: W. W. Carpenter

PURPOSE:

The purpose of this study was to determine some background factors, motivation factors and future professional plans of the student teachers in state-supported teacher training institutions in Missouri.

METHOD OF RESEARCH:

Data were obtained by the use of an information blank containing questions concerning background, motivating influences and future professional plans of student teachers in state-supported teacher training institutions in Missouri. Information blanks were returned by 404 men and 507 women student teachers.

SUMMARY:

A. Parents of the Student Teachers;

1. Ninety-eight percent were born in the United States and 60 percent in Missouri.
2. The median number of children in the family was 3.4.
3. Occupations of the fathers; 28 percent were farmers, 19 percent were skilled laborers, 18 percent were

proprietors or managers and 14 percent were professional or semi-professional workers.

4. Median income was \$5440.
5. One-half the fathers and two-fifths the mothers did not graduate from high school.
6. Eleven percent of the fathers and 9 percent of the mothers graduated from college.
7. Eighty-five percent owned their home.

B. The Student Teacher;

1. The ages ranged from 18 to 60.3 years with a median age of 21.9.
2. Approximately 70 percent were born in Missouri and 83 percent lived in Missouri prior to entering college.
3. Forty-three percent of the men were veterans of the Armed Forces.
4. Approximately 50 percent of the men and 25 percent of the women were married.
5. Approximately 60 percent lived on farms or in communities of less than 5000 population when graduated from high school.
6. Ninety-five percent attended public high schools with a median enrollment of 296.
7. Slightly over one-half followed a general curriculum while attending high school.
8. Forty-four percent ranked in the upper 10 percent and 71 percent ranked in the upper one-fourth of their high school graduating class.
9. A large majority took an active part in their high school and college extra-curricular activities.
10. Ninety percent were members of a church and practically all had an active interest in sports, music or other hobbies.
11. A majority had traveled extensively within the United States and one-third had traveled in foreign countries.
12. A large majority had worked for pay while attending high school.
13. The proximity of the college and low tuition rates were the most important reasons for selecting a college.
14. The median distance from home to college was 66.5 miles.
15. The most common means of financing college were help of parents and working.

C. Motivating Influences;

1. Approximately 10 percent were members of a Future Teachers of America Club while attending high school.
2. Approximately one-sixth had a parent who had taught school.

3. The most common experience with children was Sunday School teaching.
4. The four most important reasons for entering the teaching profession were:
 - a. Always enjoyed working with young people.
 - b. It is important to help prepare young people for life.
 - c. Enjoyed a particular subject and wished to stay close to it in adult life.
 - d. Influenced by a teacher.

D. Future Professional Plans;

1. Forty-two percent planned to teach in communities of less than 10,000 population.
 2. Forty-one percent planned to teach within 50 miles of home.
 3. Sixty-seven percent planned to teach in Missouri.
 4. Sixty-five percent planned to teach at the secondary and 35 percent at the elementary school level.
 5. Sixty-three percent of the men and 24 percent of the women planned to teach until retirement.
- Microfilm \$3.00; Xerox \$10.60. 232 pages.

QUANTITATIVE STANDARDS FOR THE IMPLEMENTATION OF QUALITATIVE STANDARDS IN STUDENT TEACHING PROGRAMS

(L. C. Card No. Mic 59-6983)

Dan Boy Cooke, Ed.D.
The University of Tennessee, 1959

Major Professor: E. S. Christenbury

The purpose of this study was to develop a set of quantitative criteria for student teaching programs which would satisfy a jury of competent teacher educators and which would serve to elicit high quality student teaching.

The study included eighty-four institutions of higher learning in the Southeastern Region of the United States which held membership in the American Association of Colleges for Teacher Education in 1958.

In order to get data to support the criteria, the writer examined the policies for accreditation of the American Association of Colleges for Teacher Education, the American Association of Teachers Colleges, and the National Council for Accreditation of Teacher Education. A four page questionnaire was developed to obtain from persons working in student teaching programs, their practices in regard to administration and organization, and their recommendations for changes which they felt would improve their student teaching programs. Replies were received from sixty, or slightly more than 71 per cent, of the participants.

From the data, the writer identified two distinct patterns of student teaching. These were:

Pattern I: The student teaching experience is provided in off-campus cooperating schools.

Pattern II: Student teaching is performed in a combination of campus laboratory schools and off-campus cooperating schools.

Data reflecting current practices, the recommendations, and professional literature, served to develop fifteen value judgments. These value judgments were presented to a jury of competent teacher educators for evaluation and endorsement. In every case, the majority of the jurors gave support to the following quantitative standards, or value judgments. No juror advocated a lower standard for any student teaching program.

Quantitative Standards

1. The student teaching experience should extend over a period of at least nine weeks, if performed on a full-time basis, and a minimum of eighteen weeks if planned on a half-day basis.
2. The college supervisor's student load should be adjusted so that he can devote a minimum of two hours each week to the supervision of each full-time student teacher.

Assuming that the college assignments are based on forty clock hours per week, a student assignment of sixteen student teachers would allow him eight hours per week to be devoted to the continuous college non-teaching responsibilities, such as travel, committee work, advisees, seminar, etc.

3. The professional preparation and experience for a cooperating teacher should be the minimum of a bachelor's degree, at least one preparatory course in the area of supervision of student teachers, and two to five years of successful teaching experience.
4. The minimum professional preparation and experience for a campus laboratory school supervising teacher should be a master's degree, several college courses in supervision, and three to five years of successful teaching experience.
5. Not more than one student teacher should be assigned to a cooperating teacher at the elementary school level, and not more than two student teachers should be assigned to a cooperating teacher at the second school level, during a quarter or semester.

If student teaching is performed on a half-day basis, exceptions may be made at the elementary school level to permit two student teachers during a day, but never more than one student teacher teaching in the classroom under the direction of a cooperating teacher at the same time.

6. Not more than one student teacher at the elementary school level should be assigned to a cooperating teacher for more than one quarter or semester during the academic year.

Not more than two student teachers at the secondary school level should be assigned to a cooperating teacher for more than one quarter or semester during the academic year.

7. The teaching schedule for all cooperating teachers should be adjusted so as to permit at least three hours each week, during the scheduled school day, for group and individual conferences with student teachers and with college supervisory personnel.
8. All cooperating school teachers should be invited to attend meetings concerning the student teaching program at least one time each quarter or two times each semester.
9. Since cooperating teachers provide a valuable service to the teacher education institutions, it seems reasonable and defensible that compensation or recognition of some type should be given.

The following formula is suggested:

<u>Per Student Teacher</u>	<u>Teacher Status</u>
\$20.00	Temporary Status: B. S. Degree, no special preparation for supervision.
\$30.00	Provisional status: B. S. Degree, one course or workshop in supervision.
\$50.00	Professional status: M. A. Degree, three preparatory courses in supervision.

Tuition-free courses for graduate credit may be substituted for the monetary awards.

10. Except under very extenuating circumstances, student teachers doing full-time student teaching should not take classes on campus.

If student teaching is performed on a half-day basis, the student teacher should be permitted to register for not more than two classes on campus. These courses should be closely related to the student teaching experience.

11. If housing and other conditions are favorable, student teachers should live in the community where student teaching is done.
12. Student teachers should participate in community activities during student teaching, but these activities should be carefully selected for their contribution to a realization of the objectives of the total experience.
13. Student teachers should be required to prepare and become familiar with all the reports and records required of the cooperating teacher.

For the student's own self-evaluation and growth, an up-to-date record, such as a diary or log, should be kept.

Some observation reports should be made, particularly in the beginning stages of the student teaching experience.

14. Where the junior high school is located in close proximity to the senior high school, instructional experience in both schools should be provided for the student teacher.

15. In order that the student might understand and test his ability to carry out the various responsibilities of the art of teaching, he should have the opportunity, under guidance, to assume the full responsibility of the cooperating teacher for a minimum of at least five days.

Microfilm \$3.05; Xerox \$10.80. 236 pages.

AN ANALYSIS OF THE INDEPENDENT READING OF SIXTH GRADE PUPILS IN SELECTED RURAL, SMALL TOWN, AND URBAN SCHOOLS OF EASTERN SOUTH DAKOTA.

(L. C. Card No. Mic 60-809)

Adeline Kralicek Cooper, Ed.D.
State University of South Dakota, 1959

Supervisor: Professor Cecil Kipling, Jr.

PURPOSES AND PROCEDURES OF THE STUDY

The purpose of this study was to investigate and analyze the status of independent reading. The factors selected for study were sex, intelligence, and type of school.

A survey of the literature in the field was made, and a pupil questionnaire and teacher questionnaire were constructed to yield information concerning the following areas:

1. Interest in reading
2. Reading interests, using eighty-eight fictitious annotated titles
3. Number of books read during the previous year and during summer vacation
4. Sources and resources for independent reading
5. Reading of magazines
6. Reading of newspapers
7. Reading of comic books
8. Television viewing

The sample included 1,251 pupils in the sixth grade. There were 640 boys and 611 girls. There were 441 rural pupils from 206 classrooms, 415 small town pupils from 22 classrooms, and 395 urban pupils from 20 classrooms. The pupils for whom intelligence quotients were available were divided into slow, average, and bright groups by computing quartile deviation. Chi square was used to determine if differences in the responses were significant.

THE FINDINGS OF THE STUDY

- A. Among all groups according to intelligence, type of school, and sex, the following were indicated:
 1. Most pupils liked to read.
 2. Most of the independent reading was done at home.
 3. Browsing in the library was the most important method for getting acquainted with the books read during the previous year.
 4. School was the most important source for books during the previous year, and home was the most important source during the summer vacation.
 5. Fiction was preferred over non-fiction among the fictitious annotated titles.

6. Mystery and detective stories from the fictitious annotated titles received top preference among all groups.
 7. Magazines were not important in the independent reading of the pupils in this sample.
 8. The comic section was the preferred part of the newspaper.
- B. Significant differences were found according to sex, intelligence, and type of school in the number of books read during the summer vacation.
- C. Sex differences were more evident than differences according to intelligence or type of school in reading interests as revealed from the fictitious annotated titles.
- D. Significant differences were found according to intelligence and type of school, but not according to sex for the following:
1. Number of books read during the previous year
 2. Number of books in the home
 3. Number of books of their very own
 4. Number of hours of televiewing per day.
- E. Significant differences were found according to sex and type of school, but not according to intelligence for the number of comic books read per week.
- F. Sources for independent reading were most favorable among the urban school pupils and the least favorable among the rural school pupils.
- Microfilm \$4.70; Xerox \$16.65. 366 pages.

A STUDY OF THE EFFECTS UPON SCIENCE TEACHING OF SUMMER EMPLOYMENT PROGRAMS IN INDUSTRY

(L. C. Card No. Mic 60-259)

Edwin Hale Cooper, Ed.D.
Rutgers University, 1958

Statement Of The Problem:

The problem that this investigation pursued was divided into three sub-problems as follows:

1. To determine the objectives and practices followed in 1955-1958 by representative companies in the United States in their summer employment programs for high school mathematics and science teachers.
2. To identify and describe new or modified ideas, information, skills, and methods in science and mathematics made available by industry to high school teachers through summer industrial employment.
3. To study the relationship of new or modified ideas, information, skills, and methods of teachers as determined in problem two with the specific objectives and practices of industry as found in problem one.

Method of Procedure:

The data for this study were obtained by two survey questionnaires. One questionnaire was designed to

determine objectives and practices followed by industry in the summer employment of teachers. Sample questions were submitted to an advisory committee of businessmen for their reaction. From their recommendations the questionnaire was prepared and sent to 104 companies throughout the United States.

The other questionnaire was designed to identify and describe new or modified ideas, information, skills and methods in science and mathematics made available to high school teachers through industrial employment. It was sent to 125 cooperating teachers throughout the United States who were employed by industry in the summer of 1957.

Then, a comparison was made between the results of these two questionnaires. From these data certain questions and their answers were considered. For example, in Chapter II, the present objectives and practices of summer employment are determined. Chapter IV indicates how well the objectives of the employment programs are appreciated by the employee-teachers. Chapter V portrays the extent to which employment practices have produced in the teachers a feeling of being more effective in the classroom. It should be noted that no attempt was made to determine how much of the data reported was actually used in the classroom.

Conclusions:

Some of the conclusions of the questionnaire to industry are as follows:

1. Teacher summer employment programs have increased, particularly in the last three years.
2. Employers usually justify the employment of teachers as follows:
 - a) To help improve the quality of science teaching.
 - b) To provide supplementary income for the teacher.
 - c) To aid industry in useful work.
 - d) To encourage youth through the teacher to pursue careers in science.
3. The most important requirement of a teacher for employment is to be a college graduate with some formal course work in science.
4. Usually there are some geographical restrictions, although a minority of employing companies have none.
5. Salary is determined generally by the job. However, for those companies with regular summer programs, it is more common to determine pay by taking the teacher's salary into consideration in establishing a rate of pay.
6. The range of the minimum number of weeks for the employment was from two to twelve with a median of eight weeks.
7. The work assigned is related generally to a teacher's abilities in science.
8. The kind of work assigned is mainly laboratory with some emphasis on engineering and production.
9. Most companies feel they receive full value for summer salaries paid teachers.
10. Evaluation is restricted generally to the time of employment.

Conclusions based on the teacher survey questionnaire were many. The following represent the major ones.

1. Summer employment caused a change in the teacher's educational objectives. For example, more emphasis was placed on the use of industrial applications in teaching, the scientific approach to problem solving, mathematical problems, student initiative in designing, setting up, and carrying out laboratory experiments, and in learning physical principles and theory.
2. Changes developed in the teacher's understanding of the scientific approach to problem solving. Some of these changes include more realization by the teacher of the importance of accuracy, the importance of the team approach to problem solving, the need for careful library research, the need to define the problem and check various ideas, and the importance of individuality to the science approach.
3. Companies with "regular" summer employment programs for teachers developed more emphasis than those with "sometimes" programs on ideas and information concerned with (a) subject matter, and (b) understanding the scientific approach. The "sometimes" companies placed more emphasis on educational technique ideas.
4. For the most part the responses of the teachers confirmed that the industrial goals of these summer teacher programs were achieved.
5. In general, the summer work experience increased the interest of teachers in science.
6. For the most part, the summer experience enabled teacher-employees to become acquainted with the applications of science.
7. Many teachers became acquainted with the findings of modern research.
8. In general, the teacher-employees thought that they would be able to better advise students in choosing a career.
9. Most of the teachers felt that they had a better understanding of how modern industry operated.
10. Generally, the work assigned was related to the teacher's abilities in science or mathematics.

Recommendations:

1. The company that follows the following guideposts will achieve a successful summer employment program for teachers.
 - a) Define clearly the objectives of the program.
 - b) Match interest and the job.
 - c) Work with the school administration.
 - d) Establish understanding and acceptance of program.
 - e) Jobs should be useful to the company.
 - f) Hire good teachers.
 - g) Pay appropriate salary.
 - h) Foster understanding of science in industry.
2. Companies should regularize and organize their summer employment programs for teachers as soon as practical.
3. Since this study has shown the value of summer employment to industrialist and educator alike, more regional committees should be formed to make summer employment a reality in that region or to improve programs already operating.
4. A study is needed to evaluate in terms of educational goals, the responses of the summer-employed teacher.

5. A study is needed to determine the extent to which the changes that teachers feel have occurred in their classroom teaching are a day-to-day reality.
6. A study is needed of a few company programs for teacher summer employment. The purpose of this study would be to develop in more detail "why" and "how" such programs operate.
Microfilm \$2.50; Xerox \$7.00. 148 pages.

THE RESOURCES FOR LEARNING ABOUT THE UNITED NATIONS AND THE KNOWLEDGE AND OPINIONS HELD BY STUDENT TEACHERS IN SELECTED COLLEGES

(L. C. Card No. Mic 59-6354)

Grace Elizabeth Gardner, Ed.D.
University of Missouri, 1959

Supervisor: Ralph K. Watkins

PURPOSE: The purpose of this study was to find out what resources there are for learning about the United Nations in colleges preparing teachers and opinions and the extent of knowledge held about the United Nations by the secondary school social studies and elementary school student teachers in some of these colleges.

METHOD OF RESEARCH: The study considered the course offerings, the library facilities, and extra-curricular activities of fifty-four colleges approved for the preparation of teachers by both the American Association of Colleges for Teacher Education and the National Council for Accreditation of Teacher Education. The course offerings were studied by means of the college catalogs. The library facilities and extra-curricular activities were investigated by means of a questionnaire.

The opinions and extent of knowledge possessed by 824 secondary school social studies and elementary school student teachers in twenty colleges were measured by a test constructed by the investigator.

SUMMARY:

- (1) The study showed that there were limited facilities for studying about the United Nations in most of the fifty-four colleges.
- (2) The course offerings of the colleges as given in the catalogs indicated that the United Nations was studied to the greatest extent in the political science departments of the colleges.
- (3) Very few courses referring to the United Nations were in the required curricula for secondary school social studies and elementary school student teachers.
- (4) There were great differences in the quantities of United Nations materials possessed by the various colleges. Outside of the few colleges whose libraries were United Nations depositories, library facilities were limited in most of the colleges.
- (5) Forty-six colleges reported having clubs in the international field that studied the United Nations.

- (6) The organized clubs on the campuses and the colleges reported the following types of activities concerning the United Nations: study about the United Nations; observance of United Nations Day or Week; holding model United Nations meetings; holding workshops on the United Nations; having assemblies; and holding exhibits.
- (7) The percentage of the membership preparing to teach in the clubs in the international field ranged from 100 per cent to 3.75 per cent.
- (8) On the United Nations test of sixty multiple-choice questions the median score for the student teachers taking the test was twenty-six or 43.3 per cent.
- (9) The median scores on the test of the secondary school social studies teachers were significantly higher than the median scores for the elementary school student teachers.
- (10) The test indicated that the student teachers knew more about the organization and structure of the United Nations than they did about the accomplishments of the United Nations or about the Specialized Agencies.
- (11) The results of the part of the test requiring answers based on opinion indicated that the student teachers held opinions favoring the United Nations.
- (12) About half of the student teachers taking the test indicated that they had learned about the United Nations through independent study and reading; a little more than one-fourth of them had acquired knowledge in pre-college work; less than one-fourth had obtained information in college courses; and very few of them had learned about the United Nations through extra-curricular work.

Microfilm \$2.50; Xerox \$8.00. 175 pages.

**FACTORS INFLUENCING MONTANA STATE
COLLEGE HOME ECONOMICS
GRADUATES FOR THE YEARS 1935
THROUGH 1955 TO ENTER, TO
LEAVE, OR TO REMAIN IN
THE TEACHING PROFESSION.**

(L. C. Card No. Mic 60-549)

Helen Lorena Hollandsworth, Ed.D.
Michigan State University, 1959

Purpose

This study was undertaken to determine factors which seemed to influence home economics graduates from Montana State College to enter, to leave, or to remain in the teaching profession.

Methods

The total number (598) of Montana State College home economics graduates for the years 1935 through 1955 were surveyed by questionnaire. Data were obtained from 540, or 90.3 per cent, of the 598 possible respondents. Of the

540 graduates, 384, or 71.1 per cent, had completed student teaching, 308, or 57.0 per cent, had entered teaching, and fifty-eight, or 10.8 per cent, were teaching at the time of the survey.

Data were analyzed by use of the chi-square test and analysis of variance.

Conclusions

Objective factors common to the entire group were analyzed by chi-square to determine significant differences between those groups of graduates who had never taught, who had taught but were full time homemakers, who had taught but were employed in other work, and who were teaching. Factors which differentiated between these groups were: (1) college grade-point average, (2) income of husband, (3) marital status, (4) total number of children, (5) children under five years of age, (6) personal goals upon entering college, and (7) personal goals at present. Factors which did not differentiate between the groups were: (1) age at graduation, (2) reasons for choosing teaching as a career, (3) time when graduate decided to teach, and (4) teachers in parental family.

Objective factors common only to those graduates with teaching experience were also analyzed by chi-square to determine significant differences between those graduates who had taught but were full time homemakers, had taught but were employed in other work, and who were teaching. Factors which differentiated between these groups were: (1) personal goals upon entering teaching, (2) size of community, (3) equipment in home economics department, (4) courses completed beyond bachelor's degree, (5) participation in other professional activities, and (6) present attitude of husband toward wife's teaching. Factors which did not differentiate between the groups were: (1) school provision for operating expense, (2) quality of supervision by state home economics education supervisor, and (3) quality of supervision by the college home economics teacher education person.

Attitude factors were assigned scores which were combined into a total "satisfaction with teaching" score. Mean satisfaction scores were computed for graduates grouped into those (1) who graduated from 1935 through 1941, (2) 1942 through 1948, and (3) 1949 through 1955. The mean scores for each of these groups, when tested by analysis of variance, were found not to be significantly different. However, there was a significant difference in teaching satisfaction of the graduates who (1) had taught but were full time homemakers, (2) had taught but were employed in other work, and (3) were teaching. The respondents who were teaching had the highest mean satisfaction score (73.0) while those who had taught but were full time homemakers or employed in other work had mean satisfaction scores of 69.4 and 65.0. The mean satisfaction score for the total group of 308 respondents was 69.5.

Microfilm \$2.50; Xerox \$8.20. 178 pages.

**AN EVALUATION OF THE IN-SERVICE
EDUCATION PROGRAM PROVIDED FOR
TEACHERS OF VOCATIONAL AGRICULTURE
BY NORTH CAROLINA STATE COLLEGE**

(L. C. Card No. Mic 59-6357)

James Truman Horner, Ed.D.
University of Missouri, 1959

Supervisor: G. F. Ekstrom

PURPOSE: The investigator sought to determine strengths and weaknesses of the in-service education program provided for teachers of vocational agriculture by North Carolina State College. More specifically he attempted to bring together data concerning (1) the professional needs of teachers, (2) evaluation by teachers of the existing in-service program, (3) accepted in-service procedures and evaluative criteria, and (4) the present in-service program in contrast with selected criteria.

METHOD OF RESEARCH: 1. Data were collected by means of an information form received from 136 teachers, representing 96.5 per cent return.

2. A form received from each of the head teacher trainers in the Southern Region provided data for comparisons and evaluative criteria.

SUMMARY: In terms of expressed need by teachers in North Carolina the most serious items among eighty on the information form was, "having in-service education opportunities conveniently available."

Three-fourths or more of the teachers indicated need for assistance in keeping up-to-date on information and techniques for effective teaching in various subject-matter areas. The highest five subject-matter areas as to expressed need were (1) plant diseases, (2) livestock and poultry diseases, (3) farm management, (4) agricultural economics and marketing, and (5) motor and machinery operation.

Teachers expressed serious need in formulating long range plans and realistic objectives, for a complete program of vocational education in agriculture.

Stimulating interest and leadership on the part of adults in adult farmer education, as well as teaching adults effectively gave teachers difficulties.

About one-half of the teachers reported that systematic placement activities were conducted in connection with high school programs, and 80 per cent expressed need for assistance in that activity.

Concerning instructional materials, less than 40 per cent of the teachers operated with definite budgets for aids. Other problems causing considerable concern were developing a filing system for printed aids and procurement of bulletins.

A set of criteria was formulated and compared with the existing in-service education program in North Carolina. Strengths were in the areas of facilities, visits to first-year teachers, and workshops. Weaknesses seemed evident in these areas: policy and planning, budget provisions, supply of new information, and technical off-campus courses.

CONCLUSIONS: 1. Teachers of vocational agriculture in North Carolina have need for conveniently available

in-service education opportunities in numerous professional activities.

2. The present in-service education program provided by North Carolina State College only partially meets the needs of teachers in conducting effective programs of vocational education in agriculture.

3. Motivation for teachers to pursue existing professional improvement opportunities is inadequate.

4. Evaluations of in-service education activities by teachers of vocational agriculture differ from those made by teacher educators.

5. The most effective in-service education media for contributing to the solution of professional problems encountered by teachers of vocational agriculture are (1) workshops, (2) small group meetings, (3) subject-matter specialists, (4) short courses, and (5) extension courses. Microfilm \$2.90; Xerox \$10.15. 221 pages.

**AN INVESTIGATION OF CERTAIN FACTORS
RELATING TO TEACHER PARTICIPATION IN A
LOCAL IN-SERVICE EDUCATION PROGRAM**

(L. C. Card No. Mic 59-6358)

Arthur Edward Jordan, Ed.D.
University of Missouri, 1959

Supervisor: W. W. Carpenter

PURPOSE:

To investigate the status, activities, attitudes and opinions of teachers; to ascertain certain factors of teacher status, teacher activities, and teacher attitudes and opinions; and to determine the relationships between those factors and teacher participation in a local in-service education program.

METHOD OF RESEARCH:

Data for the study were obtained from an information form submitted to classroom teachers of a selected suburban school district in Saint Louis County, Missouri, in which a planned in-service education program had been in operation for seven years. The teachers in the study were divided into two classifications: (1) teachers who had participated in the in-service education program, and (2) teachers who had not participated in this program.

SUMMARY:

With a maximum of 16.8 per cent of the classroom teachers identifying any single factor, the teachers considered the factors of general teacher status to be, in the descending order of frequency reported:

1. Handicaps to continued preparation in college
2. Influences to continue in college
3. Influences to participate in in-service courses
4. Handicaps to participation in the in-service education program

With a maximum of 30.3 per cent of classroom teachers identifying any single factor, the teachers considered the factors of teacher preparation and teaching experience to be, in the descending order of frequency reported:

1. Influences to continue in college
2. Influences to participate in in-service courses
3. Handicaps to participation in the in-service education program

4. Handicaps to continued preparation in college

With a maximum of 23.0 per cent of the classroom teachers identifying any single factor, the teachers considered the factors of teacher activities, directly related to teaching and to the teaching profession, to be, in the descending order of frequency reported:

1. Influences to continue in college
2. Influences to participate in in-service courses
3. Handicaps to continued preparation in college
4. Handicaps to participation in the in-service education program

With a maximum of 8.8 per cent of the classroom teachers identifying any single factor, the teachers considered the factors of teacher activities, not directly related to teaching nor to the teaching profession, to be, in the descending order of frequency reported:

1. Influences to continue in college
2. Handicaps to continued preparation in college
3. Influences to participate in in-service courses
4. Handicaps to participation in the in-service education program

Participants in the local in-service education program had more definite opinions concerning, and more positive attitudes toward, the in-service education program than did non-participants.

CONCLUSIONS:

The in-service education program of the school district investigated provided the opportunity for teachers to continue their professional preparation at the local level, but did not meet the needs of all the teachers.

Certain factors that hindered or prevented teachers from continuing their professional preparation in college influenced teachers to continue their professional preparation in the in-service education program.

Certain factors that influenced teachers to continue their professional preparation in college seriously handicapped their participation in the in-service education program.

Activities not directly related to teaching nor to the teaching profession exerted little influence upon the choices which teachers made with regard to their continued professional preparation.

Their attitudes and opinions concerning the purpose, function, operation, and value of the in-service education program depended primarily upon whether they had or had not participated in the program.

There was evidence of a greater tendency for the teachers to consider the factors of each of the areas investigated as influences to continue their professional preparation in college rather than to continue their preparation in the in-service education program.

Microfilm \$3.10; Xerox \$10.80. 238 pages.

COMPETENCIES DESIRED WITH RESPECT TO TEACHERS OF INDUSTRIAL ARTS

(L. C. Card No. Mic 60-772)

Robert Theodore Mansfield, Ph.D.
The Ohio State University, 1959

The writer felt that the following were cogent reasons for undertaking the study: (1) Teachers are probably next in importance to parents. Teachers should be the best obtainable. (2) America is a highly industrialized society. Only by understanding this society will students of today become intelligent citizens of tomorrow. (3) The writer felt a deep interest in the current industrial arts teacher education program of the Ohio State University. (4) The writer hoped that he could determine how he might be of greater service.

The purposes of the study were —

1. To determine what should constitute an adequate public secondary school industrial arts program.
2. To determine what undergraduate college training is most suitable for preparing teachers for such a program.
3. To procure insights into ways of stimulating students to strive toward the optimum of development during their undergraduate program.
4. To appraise the industrial arts teacher education program of the Ohio State University.
5. To secure data that will indicate direction for revisions which will provide the student with opportunities for optimum development.
6. To propose a program which will help achieve the above.

The writer obtained data by three sets of questionnaires. They were sent to (1) student-teachers, (2) Groups A and B of in-service teachers, and (3) administrators. The return from the student-teachers was 100 per cent, from Group A approximately 67 per cent, from Group B approximately 50 per cent, and from the administrators approximately 75 per cent. The questionnaires were tabulated by giving the percentage of replies to each question. The answers from Groups A and B were combined.

Respondents were asked to comment on certain questions. The comments were summarized. A rather high correlation was apparent in the comments of Groups A and B.

Analysis of the findings led the writer to draw the following conclusions: (1) There were some fairly serious personality discords between administrators and teachers of industrial arts because administrators did not understand industrial arts and its implications. (2) Industrial arts teachers are frequently overloaded with both class and extra duties. (3) Many programs suffer because classes are too large, the space allotted is too small, the laboratories are ill-planned, and tools, equipment and materials are unsatisfactory or lacking. (4) Industrial arts teachers recommend many more and a wider variety of experiences in their undergraduate work.

Some of the recommendations were that (1) the industrial arts teacher education program be lengthened to five years, (2) student teaching be done earlier in the professional career, (3) student teaching be increased to two quarters, and be performed in two or more situations, (4) more effective means be developed for giving prospective teachers greater insight into the "discipline" problem, (5) industrial arts teachers be free from other laboratory-type

courses, (6) beginning industrial arts teachers have at least one academic minor, (7) industrial arts teachers have a variety of work experience, (8) provision be made for experiences that would improve skill in motivation techniques and contribute to a clearer understanding of adolescent behavior, (9) industrial arts teachers develop a high degree of skill in at least two areas, (10) several courses be added to the present curriculum, (11) changes be made in the special methods course, (12) more opportunities be provided that would help prospective teachers develop satisfactory teacher-student relationships, (13) student-teachers participate in several seminars while doing their student teaching, and (14) some means be found for acquainting administrators with the true purposes and functions of industrial arts. This might be accomplished in part through industrial arts work shops designed especially for administrators.

Microfilm \$3.65; Xerox \$8.40. 282 pages.

A FACTOR ANALYTIC STUDY OF FACULTY VIEWS OF STUDENT SUCCESS

(L. C. Card No. Mic 60-780)

Roger Alan Myers, Ph.D.
The Ohio State University, 1959

Predicting success in any complex social situation requires knowledge of the kinds of behavioral events that are considered acceptable and the kinds of evaluations that are made of these events. In the area of teacher education little has been done to explore faculty members' perceptions of student behavior and to estimate the kinds of evaluations they are likely to make. This study was attempted to learn from the faculty members of the Department of Education at the Ohio State University what characteristics of students they consider desirable and how these characteristics are organized in their perception.

Twelve faculty members were interviewed and asked to describe good students and poor students. Descriptive statements were extracted from typescripts of the interviews and used as a basis for constructing a behavior check list. Copies of this check list were distributed to the entire department faculty with instructions for each faculty member to describe a good student and a poor student by rating each of the descriptive statements.

The resulting ratings were analyzed with the Wherry-Winer method for factoring large groups of items. The factor matrix which resulted included a general factor and three group factors.

The general factor was identified as a manifestation of the stereotype of student behavior which is shared by the faculty members. The first group factor was described by behavior which suggested achievement history, general academic ability and motivation relevant to the task of becoming educated. This factor was titled Readiness to Learn. The second group factor included behavior that suggested interest in student teaching, skill in observing and understanding others and warm, helpful relationships with others. The title given to this factor was Social Sensitivity. The third group factor included behavior that was rebellious, hostile and uncooperative combined with orderly, conforming, expectation-meeting behavior. The

two types of behavior were combined in a bi-polar relationship. The title given to this factor was Impulse Control.

These three factors define the dimensions of student success in the perceptions of the faculty and provide insight into the nature of the evaluations they are likely to make of student behavior.

In addition to the factor analysis, two forms of an experimental forced-choice rating scale were constructed. The scale, called the Inventory of Student Accomplishment, was designed to provide a method for rating students on an overall dimension of success. No attempt at validation of the scale was made.

Microfilm \$2.50; Xerox \$6.20. 130 pages.

THE CHARACTERISTICS OF STUDENTS IN TEACHER EDUCATION AND THE FACTORS INFLUENCING THEIR OCCUPATIONAL CHOICES

(L. C. Card No. Mic 60-693)

Curtis Phipps, Ed.D.
University of Kentucky, 1955

The Problem

The problem is to determine "The Characteristics of Students in Teacher Education and the Factors Influencing Their Occupational Choices."

Delimitations of the Study

This investigation is limited to students who were enrolled during the 1954-55 fall semester in the teacher-preparation programs, or who disclosed their intentions of preparing for the teaching profession. These students were at all undergraduate levels in one of fourteen degree-granting Kentucky institutions.

Characteristics of Teacher-Candidates

Some of the characteristics of teacher-candidates are listed below:

1. Of the 2,057 teacher-candidates, 60 per cent of them are preparing to teach on the secondary level and 34 per cent on the elementary level.
2. Students usually from homes in which the fathers are farmers, managers, officials, proprietors, and professional men. The median educational level of the parents of teacher-candidates is between the grades of eleven and twelve.
3. Church membership is held by 81 per cent of the teacher-candidates.
4. Two out of five teacher-candidates decided while in high school that they would become teachers.
5. From 5 to 7 per cent of the teacher-candidates studied do not plan to complete college without interruption.

Factors Influencing Occupational Choice

Some of the factors which influence the selection of teaching are listed below:

1. Teacher candidates consider remuneration the most undesirable feature of the teaching profession.
2. Almost half of all teacher-candidates chose teaching primarily because of an interest in children.
3. Women teacher-candidates usually graduate higher from high school than their male counterparts.
4. Teachers exert considerable influence on teacher-candidates.
5. About one in three teacher-candidates has a member of the immediate family who has at one time taught.
6. Approximately 15 per cent of the teacher-candidates credited teaching experience as an important factor.

The most desirable features about the teaching profession as seen by teacher-candidates in this study fall into three broad categories in order of importance to the candidates: (1) assistance of students; (2) personal satisfaction; (3) vacations, employment opportunities, and security.

Conclusions and Recommendations

More than one in two teacher-candidates selected teaching prior to college entrance and more than two in five during high school. At least two implications are in evidence. First, at the high school level an effort should be made to provide vocational guidance. Second, effective teacher recruiting could be carried out at this level. Apparently neither of these is being done with any uniformity.

Because few expressed dissatisfaction with the decision to prepare for the teaching profession, factors other than the associations, curricula, and activities of teachers are instrumental in influencing teacher-candidates from entering the profession after they are prepared.

The female student who is being attracted to the teaching profession is of better academic quality than the male teacher-candidate. Therefore, perhaps particular attention should be given to the selection of men teacher-candidates.

Neither the need for teachers on a particular level nor employment opportunity was given consideration when candidates selected the level on which they plan to teach. It seems reasonable to consider stressing such factors in the process of recruiting teachers.

In view of the influence which secondary teachers have upon the attitudes of teacher-candidates, those teachers should be made aware of their unique opportunity and responsibility to make a positive impression.

Microfilm \$2.50; Xerox \$8.20. 179 pages.

A CONTEMPORARY IMAGE OF THE HOME ECONOMICS ENROLLEES OF FORTY-SIX DOWNSTATE ILLINOIS PUBLIC HIGH SCHOOLS

(L. C. Card No. Mic 60-231)

Evelyn Irene Rouner, Ed.D.
University of Illinois, 1959

The purpose of this investigation was to discover the contemporary image of high school home economics enrollees.

Data were collected from the school records of 1,618 girls, who were June, 1957 graduates of 46 downstate Illinois public high schools. These girls were part of the data population of a state study, conducted by the Office of the Superintendent of Public Instruction in Illinois, in conjunction with the College of Education at the University of Illinois.

From these data, and from items of information relative to home economics enrollees gained from the "Analysis of Program Completed Inventory," prepared by Hand and Lowe, the present study was designed.

Characteristics selected from items of this APC Inventory were arranged into six pattern classifications: the individual capacity pattern, the reported achievement pattern, patterns relating to the family, the program of studies pattern, patterns relating to extra-class activities, and the first-year after graduation pattern. The data yielded by these items provided evidence bearing on the selected characteristics of the six patterns in each of the five following comparisons:

1. Home economics enrollees versus non-enrollees.
2. Enrollees versus non-enrollees, school size kept constant.
3. Enrollees versus non-enrollees, IQ kept constant.
4. Enrollees in vocational versus enrollees in general home economics.
5. One-year, two-year, three-year, and four-year enrollees were compared.

An abbreviated report of the emerging contemporary image of the high school home economics enrollees, as indicated by the findings of this investigation, were:

The Individual Capacity Pattern

1. As to the IQ distribution, slightly less than one-third of the enrollees were in the top quarter, one-third were in the second quarter, and slightly more than one-third fell in the bottom half.
2. As the amount of home economics increased, the percentage of low IQs also increased, and the percentage of high IQs decreased.

The Reported Achievement Pattern

1. The distribution of the four-year grade point averages of the enrollees who had taken one or two years of home economics was generally higher than that for girls studying home economics three or four years.

2. A larger percentage of enrollees in smaller schools received marks of "A" and "B" than was true for girls in larger schools.

The Patterns Relating To The Family

1. Almost 60 per cent of the enrollees' mothers were homemakers.
2. The majority of the enrollees' fathers were engaged in skilled and agricultural occupations.
3. Generally speaking, enrollees came from families of three or four children.

The Program of Studies Pattern

1. Eighty-one per cent took three and one-half years of English.
2. Eighty-eight per cent took one or more years of mathematics.
3. Thirty-five per cent took one or more semesters of foreign language.
4. Eighty-two per cent took two or more years of social studies.
5. Ninety-four per cent took one or more years of science.
6. Ninety-two per cent took some art and/or music.
7. Eighty-three per cent took three or more semesters of business education.
8. Seventy per cent took some home economics: 31 per cent took one year, 32 per cent took two years, 26 per cent took three years, and 11 per cent took four years.
9. Eighty-eight per cent took half or more of their work in academic courses.

The First-Year After Graduation Pattern

1. One-third of the top 15 per cent of the IQ distribution attended college.
2. Twenty-two per cent entered homemaking.

As an exploratory study, these findings raise many questions relative to guidance, curriculum and recruitment. For example, three apparent needs are: more guidance in planning programs of study, the development of scope and sequence of difficulty, and the identification of the peculiar contributions made by home economics for general education.

Recognizing these needs, a more complete image of the home economics enrollees might be gained by the investigation of:

1. The characteristics of the enrollees in the top quarter and the bottom half of the IQ distribution, who took one year, as compared with those who took four years of home economics.
2. Why enrollees are joiners and not leaders?
3. Why so few attend college?

Another major study in the light of these findings which seems imperative and current would incorporate the twelve

competences reported at the June, 1959 Convention of the American Home Economics Association. If the understandings and skills, the contributions of each major area of home economics, and the grade level (s) could be identified for each competence, the genesis for solving the urgent contemporary problems of guidance, curriculum, and recruitment would be well on the way.

Microfilm \$2.50; Xerox \$8.00. 175 pages.

RELATIONSHIPS BETWEEN PUPIL MEAN-GAIN IN ARITHMETIC AND CERTAIN ATTRIBUTES OF TEACHERS

(L. C. Card No. Mic 60-811)

Robert William Smail, Ed.D.
State University of South Dakota, 1959

Supervisor: Professor Raymond M. Schroeder

Purposes and Procedures of the Study

The purpose of this study was to determine what relationships existed between selected attributes of teachers and the average amounts of gain made by their students in the subject of arithmetic during the school year 1957-1958. The attributes selected for study were teacher intelligence, basic mathematical understandings, attitudes toward pupils, length of service, age, marital status, number of courses in mathematics, attitudes toward teaching arithmetic, number of courses in methods of teaching arithmetic, and the feelings the teachers had toward arithmetic during their own student years.

Predictive and criterion measures were selected on the basis of a survey of the literature. The Minnesota Teacher Attitude Inventory, Wonderlic's Personnel Test, and Glennon's Test of Basic Mathematical Understandings were selected and administered as predictive measures. A questionnaire was developed to secure the background data of the teachers. The Iowa Tests of Basic Skills arithmetic test was used to determine pupil growth in arithmetic, on the basis of class mean-gain between fall and spring administrations of the test.

The population of the study included ninety-seven teachers of grades four, five, and six in the public school system of Sioux Falls, South Dakota. A total of 2,438 pupils participated. There were 768 pupils from thirty fourth grade classrooms, 910 pupils from thirty-seven fifth grade classrooms, and 760 pupils from thirty sixth grade classrooms. The average class size was twenty-five pupils.

The teacher population was divided into two groups for statistical analysis. This was done by determining differences between scores obtained by teachers with two years of college education and teachers with four years of college education.

In addition to the t-tests of significance through which the criterion for the division of the teachers into groups was determined, the following methods were used to analyze the data:

1. Pearson product-moment method
2. Biserial correlation
3. Multiple regression analysis.

Analysis of the data was made to determine the relationships between the teacher attributes and pupil mean-gain for the two-year group of teachers, the four-year group of teachers, and for both groups combined.

The Findings of the Study

Significant relationships were found to exist between:

1. intelligence of teachers and their attitudes toward pupils;
2. intelligence of teachers and their understanding of basic mathematical concepts;
3. attitudes of teachers toward pupils and pupil mean-gain in arithmetic;
4. the number of courses completed by four-year teachers in methods of teaching arithmetic and the mean-gain of their pupils in arithmetic;
5. teacher marital status and pupil mean-gain in arithmetic; and
6. the average Intelligence Quotients of the classes and the gain made by the classes in arithmetic.

No significant differences in mean-gain in arithmetic were found to exist between the classes of two-year teachers and the classes of four-year teachers.

No significant relationships were found to exist between:

1. teacher intelligence and pupil mean-gain in arithmetic;
2. teacher understanding of basic mathematical concepts and pupil mean-gain;
3. the number of courses completed by teachers in higher mathematics and pupil mean-gain in arithmetic; and
4. teacher age and pupil mean-gain in arithmetic.

Microfilm \$2.50; Xerox \$7.20. 151 pages.

INDUSTRIAL ARTS IN OCCUPATIONAL THERAPY

(L. C. Card No. Mic 60-801)

Donald William Thiel, Ph.D.
The Ohio State University, 1959

The impress of change is of paramount importance within the educational scope of society in general; it affects not only the physically and mentally able but also the handicapped. The simple life of the early American has given way to an existence of advanced science, machine controlled production, and increased longevity. The schisms and social differences that a modern and growing economy based on industry and technology produces are so strong and so extensive that they raise important problems for the whole range of educational endeavor.

Industrial arts education has given little evidence of being guided by these changing concepts of life; in truth the profession attempts to ride on the comet's tail rather than accept its rightful share in the roles of leadership. By virtue of many educational hours required of the occupational therapist in his quest for the acquisition of technical skills and an understanding of technology, industrial arts education should make a resolute effort to provide adequate, worth-while, and essential services to occupational therapy students.

Purpose. The dissertation was undertaken to ascertain the contributions that industrial arts education can make

in the educational endeavors of the occupational therapist; to provide a professional instrument which might induce better public relations within the two professions concerned; and to establish a basis of understanding by revealing essential and common facts regarding the mutual concerns of occupational therapy and industrial arts education.

Methods. The study evolved from (1) a review of current and past literature of occupational therapy and industrial arts education, in an effort to determine what was being done in the field; (2) a curriculum survey of twenty-seven schools in the United States approved to offer occupational therapy, to determine what industrial arts education subjects were being utilized; and (3) a questionnaire survey of 324 registered occupational therapists practicing in the field, to ascertain the types of activities in which they received experience as undergraduates, and to further explore the number and types of industrial arts education activities used by the practitioner of occupational therapy. The questionnaire was sent to twelve graduates of each of the twenty-seven institutions. The sample included two graduates from each school over the period 1952-1957.

Findings and Recommendations. Data gained in the study indicated, by implication and by statement, that industrial arts education should —

1. Adapt the instructional programs to occupational therapy students needs.
2. Include as a part of the instructional technique a system to teach therapists how to demonstrate and present knowledge and skills acquired.
3. Place more emphasis on the development of hand tool use and care.
4. Encourage a greater degree of craftsmanship in occupational therapy students.
5. Place special emphasis upon the locations of supply houses and the types of supplies stocked that would be of interest to a therapist on the job.
6. Encourage students of occupational therapy to read, observe and evaluate various types of industrial management planes.
7. Point out the avocational interest and possibilities that are presented in industrial arts education activities.
8. Make available the services and knowledges of the specialties of industrial arts to the students of occupational therapy where and when feasible.
9. Instigate procedures for the formulation of a joint national committee to work in collaboration with the American Occupational Therapy Association, to act on matters of interest to both professions.
10. Establish a course of study for occupational therapy students that would involve the eleven treatment media of this study.

Microfilm \$3.35; Xerox \$11.70. 258 pages.

**A STUDY OF THE PRE-SERVICE AND
IN-SERVICE TRAINING OF FULL-TIME
TEACHERS IN COEDUCATIONAL PROTESTANT
CHURCH-RELATED JUNIOR COLLEGES**

(L. C. Card No. Mic 60-459)

Peter Veltman, Ph.D.
Northwestern University, 1959

This study was undertaken to determine the pre-service preparation and in-service activities of full-time teachers in coeducational Protestant church-related junior colleges and the pre-service preparation and in-service activities desired of teachers by administrators and board presidents of these institutions.

For purposes of this study three questionnaires were constructed, one for full-time teachers in the junior colleges, one for administrators of these institutions, and one for their board presidents.

Pre-service preparation concerned academic rank of teachers, degrees earned and sources of the degrees, certification of teachers, denominational and public school attendance at various levels by teachers, teaching experience prior to present position, major and minor fields of preparation, subjects taught, non-school employment, courses taken by instructors in professional education and in philosophical and religious orientation, and the general education of teachers.

In-service activities included religious activities, community activities, and professional activities.

A total of 436 full-time teachers representing 46 colleges participated in the study, as well as 46 administrators, and 33 college board presidents.

Two-thirds of the teachers held the Master's degree as their highest degree. About 9 per cent had earned some form of doctorate. Liberal arts colleges and universities were the common sources of degrees. Most common denominational school attendance by teachers was at the college level. More than half of the teachers had taught high school at one time, and more than half held a valid state teacher's certificate. Most teachers had majors and minors in two or three subjects. Non-teaching work experience was generally judged as helpful by teachers and most courses in professional and religious orientation were judged helpful as well. Least emphasis in teacher preparation in general education was upon science and mathematics. Participation by teachers in seven in-service religious activities, seven in-service community activities, and twenty-seven in-service professional activities was generally low.

Administrators and board presidents agreed that the doctorate was the degree preferred for teachers, that the liberal arts college and the university were the preferred sources for degrees, and that attendance at denominational schools, where these institutions were available, was desirable. Prior junior college training and preparation to teach in two subjects were solicited. Non-teaching work experience was favored, as well as preparation in professional and religious courses. The general education pattern preferred, by rank, was communication, social science, the humanities, natural science, and mathematics. Participation by teachers in religious, community and professional in-service activities was generally approved. Salary, lack of denominational or religious background of candidates, and general candidate shortage were the three foremost barriers to procuring new faculty members.

Areas of weakness in teacher preparation, evident from this investigation, included inadequate numbers of teachers holding the doctorate, inadequacy in religious and denominational background, lack of orientation to the junior college, insufficient preparation in subject matter, failure of teachers to participate in community affairs and professional activities, and lack of engagement by teachers in non-school employment.

On the basis of the findings of this study, several recommendations, were made. Exploration of the possibility of a doctorate in general education or a teaching doctorate was suggested. Courses in junior college orientation for teachers were advocated. The potential place of non-school employment for teachers should be determined.

A strong in-service program for teachers was suggested. Seeking institutional accreditation was recommended, as well as consideration of the community college concept for church-related colleges. An organization for mutual consideration of problems of church-related colleges was proposed.

Teachers indicated their greatest weaknesses as being in subject matter preparation, methods courses, guidance and counseling, and general education. Teacher-training institutions were urged to consider these inadequacies in their programs for preparing teachers for church-related junior colleges.

Microfilm \$3.30; Xerox \$11.50. 253 pages.

**THE HISTORY OF THE PRIVATE
SINGLE-PURPOSE INSTITUTIONS WHICH
PREPARED TEACHERS OF PHYSICAL EDUCATION
IN THE UNITED STATES OF AMERICA FROM
1861 TO 1958: A STUDY OF THE FOUNDING,
PROGRESS, CURRENT STATUS AND
CONTRIBUTIONS TO PHYSICAL EDUCATION
OF TWELVE SINGLE-PURPOSE SCHOOLS.**
(Books I-III).

(L. C. Card No. Mic 59-6231)

Hazel Marie Wacker, Ed.D.
New York University, 1959

STATEMENT OF THE PROBLEM. The aim of this study was to discover the circumstances concerning the founding of twelve private single-purpose normal schools of physical education and to trace changes in purposes, organization, facilities, finances and accreditation. In addition, factors which brought about the present status of each institution were determined and contributions to physical education identified. Institutions included in this study were Sargent College, Arnold College, Boston Normal School of Gymnastics, Posse, Savage, Kendall College, American College, Battle Creek College, Boston School of Physical Education, Panzer College, Bouve School, Inc., and Bouve-Boston School of Physical Education.

PROCEDURE. A questionnaire was sent to selected persons to secure information for direction and further investigation. Old books dating to 1862, histories of physical education, doctors' theses, journals dating to 1894, and autobiographies were reviewed to provide a frame of reference. Each institution was visited in its present situation and catalogues, yearbooks and reports examined.

Persons conversant with the history and progress of each institution were interviewed. Supplementary questionnaires and letters were sent to clarify obscure points. Secretaries of states and state departments of education were consulted concerning incorporations and accrediting. Commencement programs, diplomas, reprints, old correspondence and newspaper articles were also examined. Data from these sources were evaluated, organized and placed appropriately within the context of the study.

FINDINGS. The study revealed that all twelve schools were founded through the initiative of dedicated men and women. Circumstances motivating the foundings fall into four categories: the need for assistant teachers for the founder's private gymnasium classes; the need for teachers for particular systems of gymnastics; the need for public school teachers of physical education following compulsory state legislation; and the development of professional education in physical education. The founders were usually men and women of professional distinction. They both taught and administered their schools assisted by loyal teaching and administrative associates.

Initially, the schools were started with private funds. The control and administration was, directly or indirectly, the prerogative of the owners. Eventually, seven of the schools were incorporated not-for-profit, one incorporation was dissolved, the nature of one incorporation was not stated, and three were never incorporated. Six schools were eventually controlled by a board of trustees while five remained under the control of their owners.

Initially, the schools offered one or two-year normal courses. Eventually, six progressed to three-year normal courses, and three became four-year degree-granting teachers colleges accredited by their respective states. Only one college secured regional accrediting. Eventually, six schools merged with larger institutions, three disbanded, two combined and then affiliated with a larger college. Main reasons for this change of status were inadequate finance, limited accrediting, loss of leadership, and the competition of state-supported colleges.

The chief contributions of the schools to physical education were the development of a pioneer pattern for training teachers, the promotion of particular systems of gymnastics and physical education, the provision of teachers for schools and social agencies and the leadership of graduates. Presidents of all schools made distinguished contributions through professional leadership and writing.

SUMMARY AND CONCLUSIONS. These pioneer teacher-training institutions in physical education initiated professional education, devised and organized physical education activities, fashioned professional curriculums and established the professional status of physical education. Some graduated men and women of historical distinction. Progressing from private adventure schools to teacher-training institutions with local and state accrediting, all schools eventually disbanded, affiliated or merged under the pressure of financial and accrediting demands. Yet they served their day well and gave to physical education a heritage rich in traditions of professional excellence.

Microfilm \$7.30; Xerox \$26.10. 576 pages.

EDUCATION, THEORY AND PRACTICE

SELECTED ESSAYS OF FRANCISCO GINER DE LOS RÍOS: THEIR SIGNIFICANCE IN SPANISH EDUCATION

(L. C. Card No. Mic 60-320)

Reva Abelson, Ph.D.
St. Louis University, 1959

Francisco Giner de los Ríos (1839-1915), Spanish educator and legal philosopher, was, through his educational experiments and his writing, the chief single influence in the Europeanization of Spanish schools. Andalusian by birth (Ronda), he completed his law studies at the University of Granada, and at the age of twenty-seven earned the chair of Philosophy of Law at the University of Madrid. In Madrid, under the influence of Julián Sanz del Río, he turned to the Krausist philosophy, a system of harmonic rationalization which holds Man to be perfectible, not as an individual, but as a member of an ever-reincarnated and ever-improving race, an optimistic philosophy, described by its founder as "Panentheism," or "everything in God".

Renouncing his chair in 1867, in protest against the Minister Orovio's demand that Sanz del Río sign a confession of loyalty to the Bourbon crown and Catholic Church, Giner refused to enter politics despite the urging of his uncle, the orator Antonio de los Ríos Rosas. The revolutionary government of 1868 reinstated Giner at the university, but when Orovio returned with the Bourbon Restoration, Giner and all other Krausist professors were arrested and exiled. In his castle prison in Cádiz, Giner conceived a "free" university, one independent of government support, and in 1876 he founded the Institución Libre de Enseñanza. Later the school evolved as a primary and secondary institution, the most significant center of experimental education in nineteenth century Spain. A man of austere habits, rare moral integrity, and "encyclopedic knowledge," his only boast was that he "built men" in his school.

Giner agreed with Froebel, Pestalozzi, Spencer, etc. that knowledge should not be memorized from textbooks, but he disagreed with them in that he refused to use "tricks, antics, punishments, and rewards" as motives or sanctions in teaching. Careful observation, exact language, and strict intellectual honesty were insisted upon, and as Martín Navarro, one of Giner's students, puts it, the only definable "method" was that the pupils be loved as they were loved in their own families. No sectarian religion was taught, but the cultural study of religions formed part of the curriculum, as did art history, anthropology, archeology, and the natural sciences. Giner took the greatest possible advantage of community resources by means of visits to museums and factories and Sunday excursions to the country and mountains. As an admirer of German science and academic freedom, English sports and urbanity, and American boldness in experimentation, Giner sent his teachers abroad to study. The Institución was one of the first schools in Europe to offer vocational training. The students kept notebooks, but examinations were banished, lest the courses degenerate to a mere preparation for answering a list of stereotyped questions.

In most areas of method and curriculum, the practices of Giner are now in effect in Spanish schools. There are

many schools for vocational training. Science is taught at all levels. Visits and excursions are approved methods, and Giner is credited with the inspiration for circulating libraries and educational museums. Through his efforts, and those of his protégé, Manuel B. Cossio, art history was revived in Spain. He popularized an interest in mountain climbing, and brought physical and hygiene education into the schools. Teacher education is now at a high level.

The Junta para Ampliación de Estudios, superseded by the Consejo Superior de Estudios Científicos, a government-supported committee to encourage foreign study, came about largely as a result of his writings.

Three educational changes that Giner advocated have not occurred. (1) Teaching of the Catholic religion is still required in all public schools, (2) examinations are under the jurisdiction of the Minister of Education, and (3) the tendency is toward more, rather than less, centralized control.

Microfilm \$4.10; Xerox \$14.40. 319 pages.

**THE IDENTIFICATION OF AND PROVISION FOR
ACADEMICALLY TALENTED STUDENTS IN
SELECTED SECONDARY SCHOOLS IN
MISSOURI IN 1958-1959**

(L. C. Card No. Mic 59-6352)

Robert Fredrick Boothe, Ed.D.
University of Missouri, 1959

Supervisor: John Rufi

PURPOSE: To find the better programs for identifying and educating academically talented children in selected secondary schools in Missouri and to report them in a positive fashion and functional form.

METHOD OF RESEARCH: The principals in all public secondary schools that were classified as AAA by the Missouri State Department of Education and all non-public schools that were members of the North Central Association of Colleges and Secondary Schools were mailed a post card questionnaire. The schools which indicated, in their reply, that they made provision for the identification and education of academically talented were visited and school personnel were interviewed. Eleven of these programs were selected for a more intensive study.

SUMMARY:

- (1) The range of enrollment in the seventy-one selected secondary schools is included in the initial survey was from 180 to 2200 pupils. The median enrollment was 860 pupils.
- (2) About one half of the programs included in the initial survey were in the first year of operation.
- (3) Most of the eleven programs, which were discussed in Chapters IV and V, had been developed or approved by teacher and, or, lay committees.
- (4) Publicity was given all aspects of the program for academically talented in the majority of the eleven programs.

- (5) Ten of the eleven programs used a variety of devices for the identification and selection of academically talented students.
- (6) In the eleven programs, discussed in Chapters IV and V, a variety of procedures were used to provide guidance and counseling services.
- (7) The majority of the programs made an attempt to develop wholesome attitudes toward talent and toward the program for talented.
- (8) The majority of these schools attempted to provide for a variety of talent by grouping in subjects rather than "across the board."
- (9) Most of these programs for academically talented students utilized extra-curricular activities to extend and enrich the educational program for these students.
- (10) In these eleven schools, some attempts to provide more opportunities for academically talented are reflected in the adoption of a seven period day, extending the school day, and by providing summer school.
- (11) All of the eleven schools used homogeneous grouping as a method to provide for academically talented students.
- (12) Instructional modifications in the eleven selected programs included the use of different texts, differentiated assignments, contracts, projects, more home work, and research opportunities.
- (13) Although in a few of these schools some attempt had been made to appraise programs for academically talented, most of the persons interviewed felt that the program had not operated long enough for a valid appraisal to be made.

CONCLUSIONS:

- (1) It appears that the size (in terms of enrollment of public secondary schools has a direct effect upon the type and extent of programs for the identification and education of academically talented students.
- (2) It appears that there is marked recent increase in the number of secondary schools in Missouri that are attempting to provide for the educational needs of academically talented children.
- (3) In general the programs for the education of academically talented students are considered an integral part of the total school program and an attempt to provide for individual differences.
- (4) Better programs for academically talented reflected careful planning, which included attention to the methods to be used in the identification, selection, motivation, and education of academically talented students.
- (5) It appears that there is no set pattern, in the selected programs, for the identification and education of academically talented students.

Microfilm \$2.95; Xerox \$10.35. 227 pages.

**AN URBAN FIELD GUIDE FOR THE
ENRICHMENT OF THE NEW YORK CITY
COURSE OF STUDY IN SCIENCE FOR THE
ELEMENTARY SCHOOLS: GRADES K-6
(PARTS I AND II).**

(L. C. Card No. Mic 59-6216)

Phyllis S. Busch, Ed.D.
New York University, 1959

Chairman: Professor J. Darrell Barnard

The problem of this investigation was to develop a guidebook for use by elementary school teachers as a reference for short science field trips in the immediate outdoor environments of city schools.

Five subsidiary problems were developed in the solution of the problem. First, the list of topics covered in the New York City science courses of study for Grades K to 6 was determined. This was essential as a basis upon which the enriched outdoor experiences could be developed. The second problem involved the exploration of the facilities in the immediate out-door environments of New York City elementary schools which would provide opportunities for science experiences capable of enriching the topics in the elementary science course of study. The third was the determination of a procedure for selecting the most appropriate facilities for such enrichment purposes. The fourth problem was to prepare an illustrated handbook which would be useful for enriching elementary science programs by means of short field trips in the immediate outdoor environment of city schools. The last was the validation of the completed guide for format and usability.

A comprehensive list of topics covered by the New York City Course of Study in Science for Elementary Schools: Grades K-6 was determined from seven reports which were presented by seven committees set up by the Board of Education in 1956 for the purpose of developing the curriculum materials in the seven areas covered by the elementary science course. The chairman in charge of the current revision of the course of study in elementary science verified the comprehensive list.

Fifteen "typical" schools, three in each borough, were recommended for exploration for outdoor science - enrichment facilities by the supervisor of elementary science of the New York City schools. The schools were considered "typical" in the sense that their outdoor environments were comparable to the outdoor environments of other city schools. After exploring the environment of each school, and listing the resources, a comparison of these lists was made for the purpose of selecting those resources which were common to ninety per cent of the "typical schools." Ninety-eight resources made up the final selection.

These ninety-eight resources were further verified by exploring the outdoor environments of three other schools in each borough and were also found to be present in these additional fifteen schools.

The resources were investigated for the purpose of selecting those most worthwhile for enriching elementary science by applying the following seven criteria to each facility: (1) Is the area safe from hazards to pupils? (2) Is the facility to be explored available to the public? (3) Can the area be reached on foot? (4) Does the facility provide science-enrichment experiences that fall within

the seven content areas of the course of study which is to be enriched? (5) Can the resource be used for one or more science enrichment experiences within a thirty-to forty-minute period, including walking to and from school? (6) Can children at various age levels from K to 6 have meaningful experiences in this setting? (7) Can a pupil use the resource for one or more problem-solving experiences? Only those resources were finally considered which were judged to be good or excellent in each of the criteria.

Because a limit had to be placed on the size of a guidebook of this type, only thirty-five resources were selected. Photographs, taken by the author in the outdoor environments of city schools, were used to illustrate the facilities in the book. The organization of the material into book form was based upon the findings of the investigation, which consisted of analyses and evaluation of the available resources in the outdoor environments of city schools, by the application of the criteria which were set up to guide the selection of the available facilities.

Microfilm \$5.50; Xerox \$19.35. 430 pages.

**A STUDY OF THE PRACTICES RELATING TO
THE EVALUATION OF STUDENT PROGRESS IN
THE PUBLIC HIGH SCHOOLS OF THE PHILIPPINES**

(L. C. Card No. Mic 60-400)

Roman Romeo B. Calica, Jr., Ed.D.
Duke University, 1959

Supervisor: E. C. Bolmeier

This study seeks to determine the current policies and practices of the Philippine public high schools, the findings of research studies, and the current trends in American public secondary schools relating to the evaluation of student progress.

Questionnaires were sent to 300 secondary schools chosen to represent geographically the 363 public general and vocational high schools in the Philippines. The replies of 188 principals, as well as a review of research studies and trends in the United States, form the bases of this study.

Present practices of evaluating student progress in Philippine public high schools are determined by policies formulated by the Bureau of Public Schools. Students are evaluated separately on their scholastic achievement and their social and personal traits. The schools, the majority of which do not have any adequate program of standardized testing, employ either the individualized or the comparative basis of evaluation.

Although percentage, letter, or numerical grades may be utilized, the majority of the schools use percentage marks which are assigned in terms of multiples of five or of one. The schools, using either the averaging or the cumulative method of grading, vary in their minimum passing marks which range from 50 to 75. The lack of standardized norms of marking and the low reliability of the marks are considered two of the weakest points of the marking plan. The majority of the principals are not satisfied with the Bureau-prescribed report card and would rather develop their local reporting forms.

With satisfactory results the majority of the schools supplement the report card with conferences and informal letters. Most of the schools notify students and parents when the mark is going to be low and when the student is doing commendable work. The principals suggest the organization of testing and guidance programs, the interpretation of test results, and the employment of more conferences and correspondence for the improvement of reporting practices.

Less than 10 per cent of the schools practise mass promotion and more than 90 per cent practise nonpromotion. The average percentage of promotion, which is by the subject, is between 90 and 100 per cent. Insufficient attendance, slow learning rate, home environment, mental retardation, and poor health are the outstanding causes of nonpromotion. Majority of the principals do not favor 100-per cent promotion and believe that repeaters do better for the second time and that probationary promotion does not show satisfactory results.

Some form of student grouping is practised by the majority of the schools which frequently have one across-the-board grouping for all subjects. Most of the schools have programs of enrichment, minimum essentials, and more time to meet student needs. Administration of standardized tests, grouping according to ability, aptitude, and achievement, separate grouping for each subject or broad field, improvement of curriculum offerings, and better evaluation and reporting procedures are among the important suggestions of the principals for improving grouping practices.

Research studies indicate that evaluation is related to human needs, personal relationships, success and failure, motivation and competition, and individual differences; that sex differences, interest specialization, social status, and other factors affect teacher evaluation of student progress; that teachers' marks have very low reliability; and that the same limitations of marks always persist whatever the variety of symbols used in marking.

Experimental evidence shows the detrimental effects of failure on the student and does not seem to justify many of the failing marks based on the alleged causes of failure which may be eliminated through sound administrative and teaching practices. Moreover, there is a need to classify students at levels commensurate to their stage of progress. Studies reveal that tests for identification and classification can be used with confidence at the age-fourteen level. If grouping must be accompanied by curriculum adaptation, it should be made on a subject-by-subject basis.

To implement the 2-2 plan of the Philippine secondary schools, there is implied a need for adequate testing and guidance programs, the classification of students during the two stages of the plan, the evaluation of student progress through testing and guidance programs, the development of status-report conference plans and substitutes for the traditional report card, promotion policies with negligible rates of student failure, and the passage of legislation providing for the adequate financial support of the school programs.

Microfilm \$3.45; Xerox \$12.15. 266 pages.

CONSTRUCTION AND EVALUATION OF A SERIES OF EXERCISES TO DEVELOP ORGANIZATIONAL ABILITY IN CHILDREN'S WRITING

(L. C. Card No. Mic 59-6595)

Frederic Leonard Callahan, Ed.D.
Boston University School of Education, 1959

Problem.-- To construct a series of exercises that would develop organizational ability in children's writing.

Population.-- Six hundred and three children in an industrial city within a twenty-five mile radius of Boston. The study was conducted in twenty sixth grade classrooms --ten experimental and ten control.

Procedure.-- The groups were equated on the basis of chronological age, I. Q., language ability, and organizational ability. Data were analyzed on the basis of 246 cases in the experimental group and 223 cases in the control group.

Because there was no test of organizational ability available, a preliminary test was constructed. An analysis of each item in this test was made using the item analysis technique of Walker and Cohen.¹ A coefficient of reliability of .919 was obtained for the final test in organizational ability by the Split-Half method correlating odd and even numbered items. After application of the Spearman-Brown modified formula the coefficient of reliability was .957.

For purposes of this study the organization section of the Anderson² Scale was used in rating compositions. An estimate of reliability for this scale of .88 was obtained through Hoyt's³ method, using analysis of variance.

The preliminary testing included the test in organizational ability, The Stanford Achievement Test⁴ in language and reading, The California Test of Mental Maturity,⁵ and a test of composition writing ability which consisted of free writing on any subject or topic.

A series of twenty-four exercises were given during an eight-week period to the experimental group. During the first five weeks the exercises were in classification, discarding irrelevant ideas, outlining, sequence, and recognition of well organized paragraphs. The last three-week period was devoted to writing exercises. Most of these exercises presented a structural pattern to the child, enabling him to perceive a unified and organized "whole" of a situation in accordance with the theory of learning as conceived by the Gestalt psychologists. The final free writing exercise was designed to show whether the child could structure a situation and write a story that was organized according to logical principles of organization.

Final testing consisted of the test in organizational ability, the Stanford Achievement Test⁶ in language and reading, and a free writing test of composition ability.

Conclusions.

1. After the planned exercises in organizational ability, the experimental group was found superior to the control group. The mean score for the experimental group in the final test of organizational ability was 95.75 as compared to 89.50 for the control group. The critical ratio of 3.79 shows the difference was statistically significant in favor of the experimental group.
2. After the planned exercises in organizational ability, the experimental group was superior to the control group in composition writing. At the

end of the study the experimental group had a mean score of 2.22 as compared to 1.82 for the control group. The critical ratio of 5.63 shows the difference was statistically significant in favor of the experimental group.

3. In comparing the groups as a whole there was no statistically significant difference in language ability or reading ability at the end of the teaching period.
4. Careful analysis seems to indicate that children profit by such training at all levels of mental ability.
5. There was no statistically significant difference between boys and girls in any ability measured in the study.

Implications.-- It would seem that the child's ability to organize his thoughts in writing can be improved by a series of exercises specifically directed toward that end. As he progresses with the various types of organizational exercises and as he gains insight and experience with the structured patterns of the writing exercises, an improvement in the organization of his writing results.

There is a definite need for more specifically planned materials for teaching the skill of organizing ideas in the writing of compositions at the elementary level. An examination of current language textbooks and workbooks shows that very little provision is made for the development of organizational ability with any consistent or organized effort.

Microfilm \$2.50; Xerox \$8.00. 173 pages.

1. Helen M. Walker and Sidney Cohen, Probability Tables for Item Analysis by Means of Sequential Sampling, Bureau of Publications, Teachers College, Columbia University, New York, 1949.

2. Eleanor M. Anderson, Sandra H. Golding, Dorothy L. Harder, Mary B. Horne, Margaret M. Magee, Margaret L. McSweeney, and Alice E. Morrill, Construction and Evaluation of a Scale for Creative Writing, Unpublished Master's Thesis, Boston University School of Education, Boston, 1957.

3. Cyril Hoyt, "Test Reliability Estimated by Analysis of Variance," Psychometrika (June, 1941), The Psychometric Society, Colorado, 6:153-160.

4. Truman L. Kelley, Richard Madden, Eric F. Gardner, and Lewis M. Terman, Stanford Achievement Test, Intermediate Partial Battery, Form JM, World Book Company, Yonkers-on-Hudson, New York, 1953.

5. Elizabeth T. Sullivan, Willis W. Clark, and Ernest W. Tiegs, California Test of Mental Maturity, Elementary, 5916 Hollywood Boulevard, Los Angeles, California, 1957.

6. Truman L. Kelley, Richard Madden, Eric F. Gardner, and Lewis M. Terman, Stanford Achievement Test, Intermediate Partial Battery, Form KM, World Book Company, Yonkers-on-Hudson, New York, 1953.

INSTITUTIONALISM AND EDUCATION: AN INQUIRY INTO THE IMPLICATIONS OF THE PHILOSOPHY OF THORSTEIN VEBLEN.

(L. C. Card No. Mic 59-5606)

Charles Clarence Chandler, Ph.D.
Michigan State University, 1959

Major Professor: Carl H. Gross

This study is concerned with the educational implications of the philosophy of Thorstein Veblen. Although Veblen was a prominent economist, his philosophy has a significance which transcends this area of knowledge. The power of his thought is recognized by the anthropologist, the psychologist, the historian, the legal theorist, the sociologist, and the philosopher. Even his critics have acclaimed him as one of America's most profound social analysts.

In spite of his pervasive influence Veblen's writings have been largely neglected by the professional educator. Such a neglect cannot be defended since Veblen addresses himself to the very issues with which the professional educator must ultimately be concerned. In the final analysis a theory of education presupposes a social philosophy. An educational philosophy necessarily reflects the aims, values, and ideals of the culture in which it is expressed. The value of Veblen lies precisely in this quarter. He is not merely an economist or a sociologist or an anthropologist. Veblen is first and foremost a social philosopher.

Although Veblen wrote specifically on the problems of higher education, he did not develop a general theory of education. A theory of education is implicit, however, in his speculations on philosophy, science, psychology, technology, and economic theory. The particular conclusions which this thesis reaches are derived through an examination and logical extension of these speculations. The large body of literature dealing with Veblen's thought is utilized extensively in this respect.

Even a cursory examination of Veblen's writings reveals that his social philosophy does not provide an adequate basis for a theory of education. In particular a democratic philosophy of education must reject the totalitarian implications of his social theory. This, however, should not obscure the importance of his analysis. Although Veblen failed as a reformer, he had few equals as a critic of American culture.

Veblen is remembered as the spiritual father of Institutional Economics. He urged social scientists to study institutions in their bearing upon patterns of behavior and cultural evolution. An institution, he believed, should be evaluated in terms of its manifest function. Implicit in Veblen's Institutionalism is a theory of the proper relationship between the individual and the society. Since this issue is of crucial importance for the professional educator, it is examined in this thesis in some detail. Because Veblen denies the sovereignty of the individual, his position is rejected. Nevertheless, Veblen is one of the few social scientists who has recognized the full significance of this issue. He recognized that even a democracy can give no assurance that the claims of both the individual and the society can be properly fulfilled.

In spite of the inadequacies of Veblen's philosophy he provides the professional educator with brilliant insights concerning a variety of problems and issues. Veblen is

remembered not for his particular solutions but for the questions which he raised. He believed that education should stimulate the instinctive curiosity of men. His writings reveal the efficacy of this drive. Few social philosophers have speculated on such a wide range of important issues. Few men have had a more active "idle curiosity" than Thorstein Bunde Veblen.

Microfilm \$3.60; Xerox \$12.60. 278 pages.

THE RELATIONSHIP BETWEEN COMPETENCY IN SHORTHAND VOCABULARY AND ACHIEVEMENT IN SHORTHAND DICTATION

(L. C. Card No. Mic 59-6593)

Harriet Ann Danielson, Ed.D.
Indiana University, 1959

Chairman: Elvin S. Eyster

The Problem

The problem is a study of the relationship between competency in shorthand vocabulary and achievement in shorthand dictation. Two main factors were involved in this investigation of 120 transcription students at Indiana University, working knowledge of shorthand vocabulary and the attainment of dictation ability. The influence of general scholastic ability upon each of these two factors was also studied.

Procedure

Shorthand vocabulary was measured by constructing and administering six 250-word tests, based on random samples of Silverthorn's "High Frequency Business Vocabulary Word List." A word list was given every six weeks, on the average, throughout two semesters.

The measurement of the shorthand dictation was accomplished by the construction and dictation of 30 sets of an equated series of business letters, the source being English correspondence books. A set of letters was dictated to the students once a week, on the average, for two semesters at rates 60 through 130.

General scholastic ability was measured by the results on selected standardized tests (A. C. E., English C2, and English OM) and by the University grade-point average.

The statistical measures employed were the Product-Moment Correlation Coefficient, the Coefficient of Determination, the Analysis of Variance, and the t-tests of Significance.

Findings

Shorthand vocabulary competency was found to be significantly related to shorthand dictation achievement. Although shorthand vocabulary is a prime requisite, a necessary ingredient in attaining shorthand dictation ability, it is not the sole factor. There are other potent factors that also are requisite to dictation ability.

As a student's shorthand vocabulary index increased, his rate of taking dictation also increased. The increase in shorthand vocabulary index was continuous at each dictation-speed level from 80 to 130 words a minute.

General scholastic ability, as measured by selected indices in this study, was found to be only remotely related to ability in shorthand vocabulary.

However, a substantial relationship was found between shorthand dictation achievement and general scholastic ability. In general, students having low-level general scholastic ability were unable to attain average-or-above shorthand dictation rates. Also, students who attained high-level dictation rates generally were students of high-level scholastic ability.

Conclusions

During the learning period, continuous growth in shorthand vocabulary is a factor of prime importance in the development of acceptable shorthand dictation rates. If optimum growth in shorthand vocabulary is to be achieved, one of the primary emphases in instruction will be focused upon the building of shorthand vocabulary.

Furthermore, this emphasis will be continuous with equal force from the beginning of shorthand instruction to the attainment of the ultimate speed standards desired for shorthand dictation. Some evidence accruing from the study would indicate that the slower rate of progress in shorthand dictation above 100 words a minute than from 80 to 100 words a minute may be partially due to a smaller increase in shorthand vocabulary ability at the higher dictation-speed levels. The proportionately smaller growth in shorthand vocabulary at these levels may be attributable in part to a lessening of emphasis on the development of shorthand vocabulary in instruction.

The lack of influence of general scholastic ability on competency in shorthand vocabulary leads to the observation, if not to a defensible conclusion, that mastery of shorthand vocabulary requires abilities and capacities considerably different from those required for mastery of traditional academic subjects such as literature, history, and science.

In general, achievement in shorthand dictation is directly proportionate to general scholastic ability. In practice, this means that the chance of attaining high dictation rates for students of below-average scholastic ability is relatively small.

Microfilm \$2.50; Xerox \$7.20. 153 pages.

AN EVALUATION OF THE ACHIEVEMENT IN READING AND ARITHMETIC OF PUPILS IN ELEMENTARY SCHOOL INSTRUMENTAL MUSIC CLASSES

(L. C. Card No. Mic 59-6219)

Bernard Friedman, Ed.D.
New York University, 1959

The purpose of this study was to determine what happens to the reading and arithmetic achievement of children who are in elementary school instrumental music classes in which a portion of the day is devoted to music activities.

In this study the parallel-group procedure was used. Two groups, one an instrumental music group that devoted part of the school day to music activities, the other students in regular classes, were employed. The single variable or factor that was controlled or changed was the amount of time spent on music activities by the experimental group. The parallel group which served as the control for comparative purposes underwent the

customary elementary school course of study for the grade.

To organize the music classes for this investigation, tests were administered for musical aptitude to fourth grade pupils in each of four schools participating in the experiment. This test was a modification of the Pan American Music Test. From the pupils scoring highest, the fifth grade instrumental music classes were organized. Pupils who were already in the present fifth grade instrumental music class were promoted to the sixth grade music class to provide additional comparable groups.

The control group was organized by matching each child in the music group with another child on the basis of sex, intelligence, and age. In order to safeguard the experiment against the weight of the teacher in the learning process, matching across schools was made, so that, for example, a pupil in school "1" was not only matched with a pupil in his own school but also cross matched with a pupil in school "2" and again school "3".

The test battery used to measure achievement was the Stanford Achievement Test. In September the entire battery of nine achievement tests was administered to both groups. At the end of the school year only the tests in arithmetic reasoning, arithmetic computation, paragraph meaning, and word meaning were administered since it was with these scores that the researcher was concerned.

T-tests for dependent groups were run to determine if there was a significant difference between the means of the control and the means of the experimental group. This was done after the first scores were obtained to determine whether the matched groups differed significantly in initial status. Another T-test was run after the second set of scores had been obtained. Finally, for a further statistical treatment of this replication design an analysis of variance was made.

Our data do not indicate that the two means differed significantly in initial status in intelligence, in age, in reading or arithmetic. In the analysis of variance, the only significant difference between methods was observed in Reading Meaning in grade 5 in favor of the music group. It would seem, therefore, that there is no difference between the two methods concerning the variables.

The hypothesis that this study set out to prove was that the difference in the amount of improvement between music groups and control groups in arithmetic and reading would be attributable to chance factors and not to the kind of class organization. From the statistical evidence we can conclude that this is so. Pupils in the instrumental music classes did not do poorer than the pupils in the control classes.

Microfilm \$2.50; Xerox \$5.20. 105 pages.

TECHNIQUES, METHODS, PROCEDURES AND PROVISIONS USED IN SELECTED MARYLAND PUBLIC SECONDARY SCHOOLS IN TEACHING MATHEMATICS TO RAPID LEARNERS.

(L. C. Card No. Mic 60-611)

Major Boyd Jones, Ph.D.
Cornell University, 1959

The purposes of this study were (1) to discover and describe techniques and provisions that are being employed

in the identification and nurture of high ability students in mathematics in representative public secondary schools in Maryland, and (2) to identify ways and means by which secondary school mathematics teachers may improve their effectiveness in working with rapid learners.

A twenty-five per cent representative sample of these schools was chosen for this investigation. A three-part questionnaire form was employed in the following manner: part one, dealing with administrative practices, was checked by principals; part two, involving departmental activities and a free response type question, was checked by the heads of the mathematics departments; and part three, consisting of items relating to classroom methods and out-of-class activities as ways of meeting the needs of outstanding mathematics pupils, was checked by individual mathematics teachers. Part three was also submitted to a nationwide sample of fifty teachers who were judged by their peers to be doing outstanding work in teaching rapid learners in mathematics; and to a nationwide sample of forty mathematics educators and supervisors. These two groups afforded bases for comparison with the Maryland sample.

Over 90 per cent of the participating schools reported the practice of ability grouping either on a school-wide basis or to a lesser extent. Nearly 12 per cent selected their students for admission. (Criteria most frequently used were teacher recommendations, I Q test scores, previous grades, and Achievement Test scores—in general agreement with the findings in the literature.) Almost 60 per cent provided special courses for high ability students in mathematics. (Intermediate algebra, elementary algebra, plane and solid geometry, in that order, were the subjects most frequently designated.) School policy regarding types of programs used predominantly favored programs of enrichment. Acceleration and "leaving it up to the teacher" were given equal prominence. Over 45 per cent formed coaching groups. No senior or regular high school required more than two units in mathematics for graduation, although many students in the academic programs satisfied four units. The average class size was 32.6 pupils. (It was 26.6 pupils among outstanding secondary mathematics teachers.)

The eleven classroom procedures used most often among Maryland teachers were

- (1) Provide for individual supervision and guidance during class.
- (2) Allow superior pupils to explain solutions of special problems to class.
- (3) Allow superior pupils to give assistance to slower students.
- (4) Assign supplementary sections, questions, and problems in the regular textbook.
- (5) Encourage students to study the applications made of mathematics to science and other fields of learning.
- (6) Emphasize social uses of mathematics.
- (7) Encourage students to work at their own rate, but require each student to confine his work to the same topic as the other students.
- (8) Emphasize student self-evaluation.

- (9) Give individual assistance to students after school hours.
- (10) Provide for group supervision and guidance during class.
- (11) Allow superior pupils to conduct demonstrations for the class.

Eight of these items were among the top eleven reported by outstanding teachers (exceptions: 6,7, and 10). Nine were among the top eleven suggested by educators and supervisors (exceptions: 3 and 7)

Teachers appear to use certain techniques to a lesser extent than the associated success results would suggest. The claim that large classes seriously handicap them in making provision for talented mathematics students needs serious investigation. In general, there appears to be considerable interest in seeking out and training gifted children. Some schools and teachers apparently do not know how to deal with this situation. Some have not given serious attention to it.

Microfilm \$4 70; Xerox \$16.65. 368 pages.

PHYSICAL AND BIOLOGICAL SCIENCE MATERIAL INCORPORATED IN TEXTBOOKS FOR GENERAL SHOP

(L. C. Card No. Mic 59-6360)

Merlin Henry Kleinbach, Ed.D.
University of Missouri, 1959

Supervisor: H. H. London

PURPOSE: The major purposes of this study were to ascertain which principles of physical and biological science have application to the material taught in general shop, and to ascertain the nature and extent of the emphasis which general shop textbook material places upon the applications of those principles in the subject matter of general shop.

METHOD OF RESEARCH: Data utilized in this study were obtained from: lists of principles of physical and biological science from six studies in science education; and from an analysis of nineteen textbooks for general shop.

SUMMARY: Only 147 of the 409 principles of physical and biological science compiled in this study had application to the material in textbooks for general shop. The science topic -- Magnetism and Electricity, which included more than one-fourth of the principles, accounted for over forty per cent of the total applications. The science topic -- Matter, Energy and Simple Machines -- accounted for about one-third of the applications of principles of science.

The Industrial Arts area of electricity contained approximately fifty per cent of all applications of all principles of science incorporated in the textbooks. Over one-fourth of the applications were found in material devoted to metalworking. Over one-half of these involved principles classified under the science topic --

Matter, Energy and Simple Machines. Woodworking material in all texts and series contained nearly ten per cent of the total applications.

Five of the six General Shop Textbooks analyzed in this study each contained over 150 applications. Four of the five contained applications involving fifty or more principles of physical and biological science. Only three of the books in General Shop Series I and II contained more than 150 applications.

In general, those books which devoted larger amounts of textual material to the areas of electricity than did other texts contained larger numbers of applications of principles of science.

Of the 147 principles for which applications were found, only fifty-three had ten or more applications. With the exception of four principles, these were all classified under three science topics -- Magnetism and Electricity; Matter, Energy and Simple Machines; and Fire and Heat.

General Shop Textbooks included more applications for each page of material than did textbooks within either series, and in addition there was more consistency in the principles which these applications involved.

CONCLUSIONS: Since a majority of the principles of physical science found in the textbooks analyzed in this study occurred under the four science topics -- Magnetism and Electricity; Matter, Energy and Simple Machines; Fire and Heat; and Fluids -- it may be concluded that these science topics are more closely related to the subject matter of general shop as presently determined than are principles in the remaining four science topics.

Principles of biological science have not been incorporated to any great extent in the content of textbooks for general shop as a whole. The majority of these that have involve safety precautions or neural responses to stimuli present more commonly in wood-working shops.

The majority of principles of science have not been considered in the subject matter of general shop.

The electricity area of Industrial Arts involves more science content than other areas. Areas of metalworking and transportation also include a considerable amount of science content. The areas of woodworking and graphic arts and the minor areas of Industrial Arts as revealed by the textbooks involve very little science content.

A textbook written for general shop should contain material involving several of the major areas of Industrial Arts if it is to contribute maximally to an interpretation of principles of physical and biological science as they apply to the materials and processes used in industry.

Microfilm \$2.50; Xerox \$7.60 164 pages.

AN EVALUATION OF CERTAIN OBJECTIVES OF
HIGH-SCHOOL PHYSICS WITH REFERENCE TO THE
TRAINING OF FUTURE COLLEGE PHYSICS MAJORS
AND THE GENERAL EDUCATION OF ALL STUDENTS:
A COMPARATIVE ANALYSIS AND EVALUATION OF
THE IMPORTANCE OF CERTAIN OBJECTIVES OF
HIGH-SCHOOL PHYSICS FOR THE TRAINING OF
COLLEGE PHYSICS MAJORS AND THE
IMPORTANCE OF THE SAME OBJECTIVES FOR
THE GENERAL EDUCATION OF ALL STUDENTS.

(L. C. Card No. Mic 59-6245)

Donald Edward Lee, Ph.D.
New York University, 1959

Purpose

The purpose of this study was to determine the extent to which it is possible or desirable in a single high-school physics course to teach both for the college preparation of pupils who will later become physics majors in college and also for the general education of other pupils.

Method

A master-list of 394 specific content and behavioral objectives of high-school physics was developed. These, in turn, were evaluated by two juries--sixty-one general physics professors and 210 general physics students--to establish the importance of these items for the training of future physics majors in college. Two other juries--thirty science educators and college physical-science professors and 142 laymen--evaluated these objectives as to their importance for general education.

The reliability of the data from each jury was tested by dividing each jury into three or more groups and studying the responses of the members of each of these groups on eighty items randomly selected from the master-list. The median rating was determined for each of these eighty randomly selected items using, in turn, the data from each of the groups into which the juries were divided. The Friedman Two-Way Analysis of Variance indicated that, in general, some of the groups within each jury tended to rate everything toward higher values and others tended toward lower ratings. After this, using the data from each of the groups within each jury the items were ranked in terms of the median ratings and the extent to which the rankings were similar was tested by the Kendall Coefficient of Concordance. The data from the groups within the juries yielded rankings that were significantly the same at the 0.02 level or better.

The master-list was treated in a similar fashion. Using, in turn, the data from each complete jury, each item was given a rank in terms of its median rating. The Kendall Coefficient of Concordance indicated that these four juries were in agreement at the 0.001 level as to the ranking of the items.

The Kolmogorov-Smirnov One-Sample Test determined the extent to which the distribution of the ratings for each item deviated significantly from a reasonably expected random distribution determined separately for each jury. Some items were clearly rated of higher value than the "random distribution" and others were of lower value.

Conclusions

1. The median rating gives a reliable measure for ranking a series of items.
2. The median rating is a valid measure for ranking a series of items.
3. The relative importance of the specific objectives of

high-school physics seems to be, in general, essentially the same for the training of future physics majors as it is for the general education of all students.

4. When considering those items which were rated of high value for general education and of low value for the training of future physics majors or *vice versa*, the extent to which these two purposes should be met in a single high-school physics course would depend largely upon the philosophy of education held in the particular high school.

Microfilm \$2.90; Xerox \$10.15. 222 pages.

THE CONSTRUCTION AND USE OF A TEST OF
PHYSICAL SCIENCE AS IT IS OFFERED IN THE
STATE TEACHERS COLLEGES OF MASSACHUSETTS

(L. C. Card No. Mic 60-313)

William Howard Malone, Ed.D.
Boston University School of Education, 1959

Problem.--A test consisting of two forms of fifty items each was constructed to measure students' mastery of facts, concepts, and principles contained in an outline of a new physical science course which was first used statewide during the academic year of 1957-1958 and is required of all second year elementary majors in the Massachusetts State Teachers Colleges.

The test was administered at the beginning and at the end of this academic year to all sophomore elementary majors. Analysis of test results showed relative growth rates in mastery for the individual colleges and indicated growth in specific areas of subject matter.

Steps or methods.--Three hundred fourteen five-choice multiple-choice items were composed with the course outline as a guide. These items were used at the author's college and those answered correctly by fewer than 14 per cent and by more than 86 per cent of the students were discarded, resulting in a MASTER LIST of 230 items.

The MASTER LIST of questions was submitted to 223 students in three of the colleges. The results of this testing were item analyzed.

A jury of one instructor from each college rated the appropriateness of the items on the MASTER LIST on a five point scale ranging from "very important concept" to "not acceptable." Items with average jury ratings of less than 3.00 were eliminated.

The final test was constructed so that both forms sampled similar areas of subject matter and had comparable mean difficulties and standard deviations. The administration of the test forms yielded eight hundred and eighty four acceptable answer sheets.

Statistical treatment.--Fan's Item Analysis Tables were used with both pre-test and post-test results. The mean group differences of Fan's deltas (a linear index of difficulty) were calculated and, on the basis of critical ratios, items which showed growth (differences) significantly greater or less than the average were identified for each of the colleges. Items which showed significant growth in three or more colleges were identified.

Distribution statistics were calculated for pre-test and post-test raw scores for each of the colleges, males, females, the total population, and a restricted group consisting of six of the eight colleges. These raw scores were then converted to stanines and the mean stanines for

each group on both forms of the test and the total scores for both pre-test and post-test were determined. The ratio of post-test to pre-test mean stanines was used as an indication of group growth rates.

Estimates of variance for pre-test and post-test raw scores of both forms were used with the variance ratio, F , to show significant differences between groups. Standard errors of mean differences of test scores indicated groups whose means were significantly different at the 0.01 level from the grand means.

Inter-form reliability was expressed for each group with product-moment r 's for both pre-test and post-test.

Pre-test and post-test total scores were correlated as a measure of homogeneity of growth.

Major findings.--Relatively easy and difficult items and those which showed better than average growth were identified. Stanine ratios showed differences in rate of growth for different colleges.

Variance ratios showed that some colleges had mean scores superior to the average on certain of the tests and that the average male score was significantly higher than the average female score.

Pre-test reliability was 0.44 and post-test reliability 0.63. These reliabilities were increased to 0.65 and 0.78 respectively by using a restricted group which did not include two colleges where major sources of error were recognized.

Tentative local and statewide norms for pre-test and post-test and two usable methods of measuring growth were established.

Microfilm \$2.50; Xerox \$6.80. 143 pages.

**AN EXPERIMENTAL STUDY OF THE USE OF
DISCUSSION GROUPS IN GENERAL CHEMISTRY
AND GENERAL SCIENCE AS A MEANS OF
INCREASING GROUP GROWTH
IN CRITICAL THINKING**

(L. C. Card No. Mic 59-6311)

John J. Montean, Ph.D.
Syracuse University, 1959

Supervisor: Alfred T. Collette

This study was designed to determine the effectiveness of the use of discussion groups as an instructional device for increasing the ability to think critically. The Test of Critical Thinking, Form A, was employed to appraise the development of critical thinking abilities. The population consisted of junior college freshman students normally enrolled in pre-engineering and in general education courses of study. The investigation was conducted in three phases.

The first phase was concerned with an analysis of pre- and post-test scores achieved on the Test of Critical Thinking Form A, by individuals in the experimental and control classes after one semester of instruction in general chemistry and in general education physical science. There was significant improvement of critical thinking for each of the population of the two disciplines examined. This increase in critical thinking ability as evidenced by the results of the study was especially related to gains

made by the experimental classes undertaking instruction through the use of discussion groups in general chemistry and in general education physical science.

The second phase was designed to gain evidence of the relation of mental ability to critical thinking for each of the three sub-groups of students for each method in the general chemistry and in the general science populations. The test score obtained by the student during the registration period on the American Council on Education, Psychological Examination, 1954 Edition, served to classify the student as either high, median or low mental ability. The upper 27 percent constituted the high level mental ability, the middle 46 percent the median level mental ability, and the lower 27 percent the low level mental ability as the three sub-groups for both methods. Significant results demonstrated that students of median and low mental ability in the experimental classes demonstrated a greater gain in the ability to think critically than did students of similar mental ability in the control classes. In regard to the disciplines themselves, the students of high ability in the experimental general science group demonstrated a significant gain when compared to the performance of students of similar ability in the control class. Since this was not the case with the general chemistry high ability group, it may be assumed that the use of the discussion group method favors the high ability student in the general science context. In regard to students of low ability, a significant gain was made in the experimental general chemistry which was not the case with the low ability experimental general science. Thus, it may be inferred that the use of the discussion group method favors the low ability student in the general chemistry context. These differences may be related to the nature of the material or course content of general chemistry and of general science.

The third phase of the study was undertaken to determine which method is more effective with regard to achievement in general chemistry and in general science. The approach to this study was through the use of four hour examinations which were given throughout the semester. The test items for the hour examinations were obtained primarily from Questions and Problems in Science Test Item Folio No. 1. The remaining items of the hour examinations were developed and modelled after the folio items and in keeping with the course content.

This investigation was twofold; first in regard to the results obtained on the items of the four hour examinations and secondly, in regard to the results obtained on the folio items. In regard to both the all-items analysis and to the folio items analysis, the experimental class made significant gains and it may be stated that the experimental group realized to a greater degree the fundamental subject matter objectives, compared to the students realizing these same objectives by conventional methods.

In regard to achievement in general science, two instruments were used to determine whether subject matter in general science would be learned as well under a discussion group method of instruction as under the lecture method in a general education course. The two instruments employed contained type items that were based on recall of factual knowledge and items based on the understanding of principles. There was significant difference in favor of the discussion group experimental class with regard to the understanding type items. No significant difference was evident for recall items.

It may be stated with reasonable confidence that students undertaking the study of freshman general chemistry and general science may do so without experiencing loss of achievement in these areas.

Microfilm \$3.05; Xerox \$10.60. 234 pages.

THE SELECTION OF PRINCIPLES REGARDED BY PERSONS INVOLVED IN TEACHING AND LEARNING AS FUNDAMENTAL FOR TENTH GRADE GENERAL BIOLOGY

(L. C. Card No. Mic 59-6791)

Donald Drum Rabb, Ed.D.

The Pennsylvania State University, 1959

What principles are fundamental in constructing a tenth grade general biology course for all students whether or not they are going to college, and regardless of their choice of occupation?

In an attempt to solve the problem as stated above, a well known list of one hundred principles of the biological sciences of importance for general education was selected as a basis for this investigation. The list was modified by consolidating and revising the principles with respect to the findings of recent research. This revised list of sixty-five principles was then incorporated into a check-list questionnaire and distributed to four sample groups to determine appropriateness for inclusion in a tenth grade general biology course including both terminal and college-preparatory students. Questionnaires were returned by forty-two college biological science educators, one hundred and thirty-four secondary biology teachers, and seventy-seven recent alumni of three selected high schools, and one hundred and sixty-four college students. The sampling was limited to the state of Pennsylvania.

The responses to the check list were tabulated for each of the four sample groups. The responses to each principle in the three categories "essential," "desirable," and "unnecessary" were converted into a numerical value or index number by the use of a weighting formula. The principles were then ranked in order of their importance as rated by each of the responding groups. The primary objective of investigation was the determination of a final ranking of the sixty-five principles on the basis of the evaluations of the four sample groups.

A statistical analysis was made in order to determine the extent of the influence of chance in the obtained results, the degree of correspondence between the responses of the four sample groups, and the significance of the data.

From the tabulation and analysis of the data the following conclusions and implications of the study evolved:

1. The ranking of the principles established in this study provides a basis for the selection of topics for emphasis in the general biology course at the Benton Joint High School, Benton, Pennsylvania. The findings of the study, however, would probably be appropriate from which to select course content for general biology courses in many similar high schools throughout Pennsylvania.

2. Major emphasis in constructing a course of study in general biology should be given the principles that come under the following topic headings arranged in order of emphasis: (1) Reproduction, (2) Protoplasm and Cells,

(3) Physiology and Morphology, (4) Organization, (5) Energy and Matter, (6) Ecology, and (7) Genetics.

3. Comparison of the emphasis of topics established in the present study with a recent investigation of the emphasis usually given topics in high school general biology suggests: (1) that greater emphasis should probably be given the topic "Reproduction" than it is now being afforded; (2) that the current high emphasis given the topics "Protoplasm and Cells," and "Physiology and Morphology" is justifiable; and (3) that the major emphasis placed on the topic "Genetics" is probably greater than it should be.

4. With the exception of a few items in which there was a marked difference of opinion, there was a high degree of correspondence in the rank assigned the various principles by the four groups investigated. The degree of correspondence was greatest between the closely allied samples such as the two teacher groups and the two student groups.

5. The high degree of relationship between the evaluations of the various sample groups indicates that all of the groups investigated anticipated the needs for the general education of high school biology students.

6. The secondary biology teachers had a marked tendency to rank more of the principles as "essential" than any of the groups investigated.

Microfilm \$2.50; Xerox \$6.80. 142 pages.

POTENTIALITIES OF AN ORAL VOCABULARY TEST

(L. C. Card No. Mic 59-2800)

Jennye Faye Schultz, Ed.D.

University of Maryland, 1958

Supervisor: Dr. Alvin W. Schindler

The purpose of this study was to secure data which would enable teachers to make more effective use of mental maturity tests and reading tests in evaluating pupils with reference to reading needs and achievement. There was particular emphasis on determining the potentialities of the vocabulary section of mental maturity test when it is read to pupils individually by a teacher.

Procedure:

The test population included 102 fifth grade pupils and 122 sixth grade pupils.

The California Test of Mental Maturity, Grades 4-8, and The California Reading Test, Form W, Grades 4-6, were administered. Also Section Seven of the mental maturity test was administered as an individual oral vocabulary test. The Durrell-Sullivan Reading Capacity Test, Form A, Grades 3-6, was administered to 42 select fifth grade pupils.

The reading achievement test and the mental maturity tests were administered by the writer and by classroom teachers during late September and early October 1957. A month after administration of the mental maturity test, the vocabulary section of that test (Section 7) was read to each pupil by the writer as an oral vocabulary test. Each pupil responded orally.

In December, 1957, forty-two selected pupils in the fifth grade were given the Durrell-Sullivan Reading Capacity Test.

Findings:

(1) The corrected reliability coefficients for the silent and oral vocabulary tests were .87 and .83, respectively. The difference was not significant.

(2) The mean performance of the 224 pupils was 22.4 for the silent test, 23.4 for the timed oral test, and 26.6 for the untimed oral test. The difference between the first two means is significant at the .01 level. The difference between the first and third mean is also significant at the .01 level.

(3) The coefficient of correlation between performance on the silent vocabulary test and performance on each version of the oral vocabulary test was $.69 \pm .05$.

(4) A coefficient of .61 was found between performance on the oral vocabulary test and performance on (a) reading comprehension and (b) reading vocabulary sections of the reading achievement test. The silent vocabulary test correlated .72 with reading comprehension and .76 with reading vocabulary. There was a significant difference at the .05 level between coefficients of .61 and .72 and at the .01 level between coefficients of .61 and .76.

(5) A coefficient of .27 was found between performance on the non-verbal section of the mental maturity test and the silent vocabulary test. The oral vocabulary test correlated .28 with the non-verbal section. There was no significant difference between these two coefficients. There were significant differences in the oral and silent vocabulary performance of pupils grouped according to differences in verbal and non-verbal than verbal performance.

(6) The correlations between non-verbal test performance and reading comprehension was .34. The correlation between non-verbal test performance and reading vocabulary was .31.

(7) Pupils scoring higher on the silent vocabulary test than on the oral vocabulary test had significantly (.01) higher reading achievement than pupils scoring higher on the oral vocabulary test. There was also a significant difference in reading achievement test performance of pupils who scored equally well on the two vocabulary tests and pupils who had higher oral than silent vocabulary performance (.05 reading comprehension, .01 reading vocabulary).

(8) There was no significant difference in the reading capacity test scores for 42 selected pupils having wide differences in verbal and non-verbal mental maturity scores. Pupils who scored high and low on reading achievement revealed a significant (.05) difference in reading capacity test performance. Pupils who differed widely in oral and silent vocabulary performance revealed no significant difference on the reading capacity test.

Major Conclusion:

If a vocabulary test is administered orally after it has been administered silently, the data can be helpful in evaluating a pupil's potentialities for reading achievement.

Microfilm \$2.50; Xerox \$6.60. 137 pages.

A DEVELOPMENTAL APPROACH TO TEACHING THE CONCEPT OF PROOF IN ELEMENTARY AND SECONDARY SCHOOL MATHEMATICS

(L. C. Card No. Mic 60-795)

Eugene Preston Smith, Ph.D.
The Ohio State University, 1959

Traditionally, in the teaching of mathematics, proof has been a focal point of emphasis only in demonstrative geometry. It is now recognized that proof is a continuing theme throughout all of mathematics. The problem of the dissertation was to explore and to make explicit some methods of emphasizing the concept of proof in elementary school mathematics and of nourishing the growth of this concept in all secondary school mathematics classes.

Proof is defined in this research as "that which convinces." The nature of proof as a continuously evolving concept in mathematics is then analyzed from both the child development and mathematical points of view. As one might expect from a careful analysis of the definition above an acceptable "proof" on one level of maturation may not be acceptable on a more advanced level.

An individual's concept of proof in mathematics develops and matures from an initial dependence upon empirical evidence and inductive and informal reasoning processes toward a recognition of the need for and skill in deductive, abstract, formal reasoning. Some evolutionary trends in this process include--

1. A gradual reduction in the amount of induction accompanied by an increased use of deductive procedures.
2. An initial dependence upon the acceptance of many ideas without proof to the acceptance of fewer and more abstract general ideas as foundations for necessary inference.
3. A continuously increasing use of symbolism.

Initially, mathematics is an outgrowth of the experiences of youngsters. Assumptions are products of the manipulation of physical objects and the gathering of empirical data. Elementary school children use such assumptions as though the generalizations were inherent in the "nature of things." There is evidence to support the view that children of elementary-school age can reason validly only from premises they believe to be "true." In high school, these same students can be expected to reason correctly from sets of premises regardless of the truth-values they assign to the premises.

Through the teaching of mathematics in elementary and secondary schools the salient features of probable or inductive inference and necessary or deductive inference can be developed. Students can be helped to distinguish between these two types of inference and to develop criteria for judging the reasonableness or reliability of their probable inferences and the validity of their necessary inferences. Concrete suggestions are made for helping students evolve a continuously more mature concept of proof as they study arithmetic, algebra, geometry, and trigonometry.

The suggestions embodied in this study do not require radical changes in content; rather the emphasis is upon changes in methodology. There are certain new topics, however, such as the use of the counterexample, existence

theorems, quantifiers, and the elements of the sentential calculus that are new concepts for the usual elementary and secondary school mathematics programs.

Logic reigns supreme in mathematics, but students are fallible human beings and the ways in which people first comprehend mathematical truths are not always logical ways. It is the interplay of empiricism, intuition, and logic that provides the fascination of mathematics. No one of these elements alone suffices. There is a need to teach guessing as well as formal methods of proving theorems. Empirical evidence may lead to a conjecture that is escorted into the annals of mathematics by the formalities of logic. Even a highly promising guess does not point the way to a specific method or technique for proof. This too must somehow come from the imagination and creative genius of a human mind.

Microfilm \$6.60; Xerox \$23.40. 520 pages.

THE VALUE OF MULTI-SENSORY LEARNING AIDS IN THE TEACHING OF ARITHMETICAL SKILLS AND PROBLEM SOLVING—AN EXPERIMENTAL STUDY

(L. C. Card No. Mic 60-456)

Dana F. Swick, Ph.D.
Northwestern University, 1959

Chairman: Harold G. Shane

Location: The study was conducted in the Kingsport, Tennessee public schools during the school year, 1953-54. The years immediately following 1954 were used for follow-up purposes.

Purpose: The major purpose of the study was to determine, experimentally, if a planned arithmetic program using selected multi-sensory learning aids increased the learning and understanding of elementary school arithmetical processes.

Subordinate purposes of the study were:

1. to determine if there was value in this experimental program for certain groups of students with particular intellectual or academic characteristics.
2. To determine if this program would have any influence on pupils' attitudes toward arithmetic.
3. To determine if this program would have any influence on teachers' attitudes toward arithmetic.
4. To determine if the multi-sensory type of teaching program was continued after the experimental phases of the study had been terminated.

Design: The study was divided into two periods. During the first period, 15 groups of children, grades two through five, were taught arithmetic by the method in use in the Kingsport schools before the study began.

Tests in arithmetical computation, arithmetical reasoning, and quantitative understanding were administered to 457 pupils before the study started. These same tests were administered at the end of the study's first period to establish a normal amount of arithmetical progress for the participants.

The second period was similar to the first, except that a carefully planned arithmetic program making use of multi-sensory concrete teaching aids was introduced. This program was carried out by the 15 teachers who continued with their respective groups.

Tests in computation, arithmetical reasoning, and quantitative understanding were administered to the 404 pupils who were participants during the entire study. These test results were used to determine the progress made during the second period of the investigation. The progress made during the second period of the study was then compared with the progress made during the initial period.

The amounts of progress for each period of the study were treated to determine if a statistically significant amount of progress had occurred during the second (experimental) period of the research project.

In addition to the handling of test results, the design of the study provided an opportunity to study possible changes in attitude toward arithmetic in both pupils and teachers. The attitude changes in pupils were investigated by an examination of the following materials: (1) ratings given arithmetic; (2) descriptive paragraphs written about arithmetic; and (3) recorded comments that were made by pupils.

Possible attitude change in teachers was determined by an examination of the comments the teachers made during the study or by an observation of changed professional activity or attitude which may have resulted from participation in the study.

The observed use of multi-sensory aids in the classrooms of the entire city school system in the years immediately following the ends of the project offered another check upon the value of the experimental program.

Findings and Conclusions: The findings of the study gave strong support to the desirability of using multi-sensory aids in teaching both arithmetical computation and reasoning.

With the exception of the fourth and fifth-grade pupils high in arithmetical achievement, there were no findings to suggest possible values for pupils either high or low in achievement.

The findings failed to suggest that the experimental program had special values for pupils of either high or low intellectual ability.

During the experimental period, the attitude toward arithmetic improved for second and third-grade pupils. This indicated a value in beginning a multi-sensory program in the early grades.

The success of the program was revealed in better teacher attitude toward arithmetic and in continued use of multi-sensory aids.

Microfilm \$4.30; Xerox \$15.10. 333 pages.

ENGINEERING

ENGINEERING, AERONAUTICAL

THE MIXING AND COMBUSTION OF A SUPERSONIC FUEL JET AND A SUBSONIC, COAXIAL GAS STREAM.

(L. C. Card No. Mic 59-5222)

John Edward Scott, Jr., Ph.D.
Princeton University, 1959

An experimental investigation of the mixing and burning of a compressible fuel jet with a coaxial air stream is described. The progress of the mixing and burning in the mixing duct is followed by observing the spatial variation of static pressure in the mixing duct. It is found that the combustion of the fuel jet behaves in a manner similar to that of a turbulent diffusion flame in which the time required for chemical reaction is negligibly small compared to the time required for mixing. Experiments verified that the duct length required for mixing and for mixing with simultaneous chemical reaction of the gaseous fuel jet are identical and are independent of the amount to be mixed and burned.

An integral analysis of a quasi-one-dimensional nature is presented in order to aid in the interpretation of the experimental data. The resulting system of equations, describing the flow field in the mixing duct in terms of a mixing parameter, are not amenable to practical solution because of their complexity. Hence, the equations are simplified by assuming that the flow field is "piecewise uniform" over the mixing duct cross section. The analytical variation of the static pressure in the mixing duct agrees in a semi-quantitative manner with the experimentally observed variation of pressure with distance downstream of the inlet.

The experimental and analytical results are combined to provide the spatial and temporal variation of the mixing parameter. The case of mixing with simultaneous chemical reaction and the case of mixing only are reported in order to ascertain the influence of heat addition through chemical reaction on the mixing process in the duct. It is found that the combustion process has the general effect of increasing the mean velocity in the mixing duct which increases the turbulent exchange coefficient and, hence, increases the mixing rate. For the experimental geometry considered, the mixing and burning time is roughly half of the time required for mixing only. The mixing time is found to be independent of the amount to be mixed, and the mixing and burning time is independent of the quantity of energy released in the chemical reaction.

The presence of a condensed phase in the fuel jet produced the same results as for the case of mixing without combustion and also for the case of mixing with chemical reaction provided that the overall equivalence ratio is not too small. However, for small values of the equivalence ratio, the process of molecular diffusion is required to en-

able the complete combustion of the condensed phase. Since this process occurs at a rate considerably smaller than the corresponding turbulent process, the mixing duct length requirement is markedly increased for this type of fuel jet.

The general conclusions drawn from the simplified quasi-one-dimensional analysis can be considered to be only qualitatively correct because of the very crude model of the flow field which is employed. Even in this case, however, the solution of the system of equations is almost prohibitively difficult. Several related problems more amenable to this type of analysis are presented.

Microfilm \$2.50; Xerox \$8.20. 177 pages.

ENGINEERING, AGRICULTURAL

GRAIN DRYING RATES AND ZONE DEPTHS AT THE STEADY STATE

(L. C. Card No. Mic 60-574)

Norton Conrad Ives, Ph.D.
Iowa State University of Science and Technology, 1959

Supervisors: William V. Hukill and
Henry M. Black

A general prediction equation was developed by dimensional analysis and experimental observations on a specially designed counterflow dryer to express the drying time of a kernel of wheat when dried at steady state conditions. It was determined that the true drying time for wheat is dependent only upon (1) the moisture contents of the wheat entering and leaving the counterflow column, and (2) the temperature and humidity of the entering air. It was concluded that the air velocity or the air to grain flow ratio has insignificant effect on the kernel drying time. Although the depth of the drying zone was observed apparently to be directly proportional to the air velocity, the analysis indicated that it was not the effect of air velocity which changed the depth of the drying zone, but that it was the quantity of heat supplied for drying, which varies in direct proportion to the mass rate of air supply other conditions remaining constant, that determines the depth of the drying zone.

Steady state drying conditions were obtained by a specially designed experimental, laboratory unit. The laboratory specimen was a small core of grain which was cut into experimental increment depth units by use of a series of trays, each two inches deep, placed in a stack like supers in a beehive to form the column of grain. Cyclic removal of a dried bottom tray and addition of a fresh top tray

simulated counterflow drying and, with proper control, steady state drying conditions.

Wheat was employed for this testing program. Initial moisture contents varied from 53.6 to 22.2 per cent d.b., final moisture contents from 34.4 to 13.4 per cent d.b., entering air temperatures from 108 to 260°F., entering air dew points from 45 to 80°F., and drying air velocities from 50 to 150 fpm.

The true drying time of a kernel of wheat, or the travel time of a drying kernel of wheat through the drying zone, which are synonymous, was observed to vary approximately as follows:

1. Inversely as the $3/4$ power of the maximum potential vapor pressure difference driving force at constant barometric pressure
2. Inversely as the $1/4$ power of the partial vapor pressure of the entering air at constant barometric pressure
3. Directly as the log of the entering moisture content of the wheat
4. Inversely as the 1.4 power of the leaving moisture content of the wheat.

The general prediction equation is:

$$T_k = (1.08 \log \frac{M_i}{14}) (\frac{4400}{M_0^{1.41}} - 30) (\frac{0.608}{[(P_w - P_v)/P_b]^{.74}}) (\frac{0.311}{(P_v/P_b)^{.247}})$$

where T_k is the kernel drying time in minutes; M_i and M_0 are the initial and final grain moisture contents, per cent dry basis; P_w , P_v and P_b are respectively the saturation vapor pressure at entering air temperature, the vapor pressure of the entering air and the barometric pressure all in lbs/in².

Extrapolation of this prediction equation to a typical set of drying conditions for a slow, drying-in-storage system, gave a calculated kernel drying time for wheat to dry from 20 to 13 per cent wet basis, as 10 hours. This is a mean effective drying rate of 1 per cent d.b. per hour. The overall drying time for a bin of such wheat with an average rate of air supply assumed to be 5 cfm per bushel, calculated to be about 100 hours. The depth of the drying zone, D , in such a bin where the final depth of the dried wheat would be 8 feet, calculated to be about 10 inches.

Applying the general prediction equation to a fast counterflow system showed that good evaporative heat use efficiencies could be obtained when using up to 250 cubic feet per minute of drying air per bushel of wheat, if an entering air temperature of 220°F. could be tolerated to remove 3 per cent d.b. in the counterflow column. Subsequent cooling of wheat from such a system could remove an additional 4 per cent d.b. of moisture. The capacity of a counterflow column 5 feet x 5 feet in cross section and 9 inches deep operating at these drying conditions was calculated to be about 90 bushels per hour.

Microfilm \$2.50; Xerox \$6.60. 136 pages.

HYDRAULIC CHARACTERISTICS OF SINGLE TILE LINES

(L. C. Card No. Mic 60-575)

Howard Paul Johnson, Ph.D.

Iowa State University of Science and Technology, 1959

Supervisors: Professor Hobart Beresford and
Professor M. G. Spangler

The effect of misalignment on tile capacity, and the nature of flow in single field tile lines were investigated in the study. The relation of tile misalignment to the Weisbach friction factor was observed in a laboratory investigation. Pressure distribution and flow rates in tile lines were studied in a field experiment.

Laboratory Study

Tests were made through a Reynolds number range of 3.5×10^4 to 2.5×10^5 for misalignments (displacements of longitudinal centers) of 3.2, 6.0, 8.8, and 14.7 per cent of the diameter and for length-to-diameter ratios of 1.3, 2.6, 3.9, and 5.2 on 1-1/2-inch and 2-inch plastic model tile. Results of the tests showed that the capacity of tile may be reduced to 80 per cent of present design standards within the range of expected field misalignment (misalignments of less than 6 per cent of the diameter). Tests of misalignment of more than 6 per cent indicated that tile capacities could be reduced much more. Tile capacities may be increased somewhat by enlarging the length-to-diameter ratio provided similar alignment is maintained.

Offsets were held constant in all cases except in one series of tests in which misalignment was varied according to a normal statistical distribution. Observations indicated that the mean value of a series of measured misalignments results in the same resistance to flow at the same Reynolds number as a constant misalignment of the same magnitude as the mean. This statement is restricted to the range of Reynolds number and standard deviations of the tests.

Field Study

The experimental field installation consisted of four individual tile lines which were operated independently, and through which water was circulated at several rates. Severe changes in grade were incorporated in the lines. Pressures were measured at seven points along the lines; the quantity of flow entering and discharging was recorded. The lines, constructed of 4-inch or 4-inch and 6-inch tile, were installed without breathers or pressure relief risers.

The pressure distribution in the lines during the tests indicated that the flow was not comparable to closed-conduit flow. Air entry into lines at points of increased grade permitted development of pressures only slightly less than atmospheric. Where positive pressures were encountered, flow was not uniform because of seepage from the lines.

Since the slope of the hydraulic gradient was not parallel to the tile line grade, the quantity of water flowing in the lines varied considerably from the quantity predicted by present design. Thus, although the tile line grade is a convenient design factor, it has only a limited relationship to the slope of the hydraulic gradient.

Measurement of the pertinent variables related to Manning's coefficient indicated the capacity of the experimental lines varied from 85 to 100 per cent of design capacity.

In order to supplement the data from the experimental studies with data from contractor's installations, measurements of misalignment of tile were made at four sites. Average misalignments of less than 5 per cent of the tile diameter were recorded for the four samples obtained.

Microfilm \$2.50; Xerox \$7.60. 161 pages.

THE TRACTIVE FORCE THEORY APPLIED TO THE STABILITY OF OPEN CHANNELS IN COHESIVE SOILS

(L. C. Card No. Mic 59-6386)

Ernest Thomas Smerdon, Ph.D.
University of Missouri, 1959

Supervisor: Robert E. Stewart

The tractive force theory presents a logical criterion by which the problem of the stability of open channels in cohesive soils can be investigated. The purpose of this study was to investigate a number of cohesive soils, both in a soil physics laboratory and in a hydraulic flume, in order to determine if the critical tractive force could be correlated to the physical properties of the soils.

Eleven Missouri soils were selected for the tests. These soils were chosen in order to give a very wide range in the degree of soil cohesion. The soils ranged from a silty loam soil with very little cohesion to a highly cohesive clay soil. The plasticity indexes of the soils ranged from 6.6 to 44.1.

The critical tractive force of each soil was determined from tests in a hydraulic flume which was 60 feet long, 2.51 feet wide and 1.5 feet deep. The hydraulic flume was equipped so that soil samples could be placed in the bottom of the flume for the tests. The critical tractive force for each of the soils tested was then related to pertinent physical properties of the soils.

The data from the hydraulic tests and physical tests on the soils were analyzed statistically to determine the significance of the apparent correlation between critical tractive force and pertinent soil properties. For the soils tested, the critical tractive force was found to be well correlated with each of the following soil properties: (1) The plasticity index, (2) the dispersion ratio, (3) the mean particle size, and (4) the per cent clay. A less significant correlation existed between critical tractive force and the phi-mean particle size.

The data indicated that the critical tractive force exhibited a logarithmic relationship to the soil properties selected for analysis. Therefore, in the statistical analysis, it was often more fruitful to use the common logarithms of the values instead of the values themselves. This procedure permitted straight line regression equations to be fitted to the experimental data. To evaluate the scatter of the experimental points about the regression line, the standard deviations from regression were determined for each set of data.

The results of the study indicate that the following conclusions can be drawn: (1) The problem of the stability of

open channels in cohesive soils can be studied on the basis of the tractive force theory. (2) The critical tractive force in cohesive soils is related to certain physical properties of the soils. Therefore, the effect of soil cohesion on open channel stability can be determined by physical tests of the soils. And (3), for the soils tested, the critical tractive force is best correlated to either the plasticity index or the dispersion ratio, although good correlation also exists between the critical tractive force and either the mean particle size or the per cent clay.

Microfilm \$2.65; Xerox \$9.25. 202 pages.

ENGINEERING, CHEMICAL

THE CLEANING AND PREPARATION OF METALS FOR ELECTROPLATING: A STUDY OF METAL DEPOSITION ONTO OXIDIZED COPPER SURFACES.

(L. C. Card No. Mic 60-5)

David O. Feder, Ph.D.
Columbia University, 1959

The mechanism of nickel deposition onto oxidized copper surfaces has been elucidated by an experimental method which combines electrodeposition procedures with high vacuum, microchemical and controlled atmosphere techniques. Since the processes of interest occurred within the first several atom layers of the reacting species, their elucidation required certain special experimental conditions so as not to mask these processes by gross effects. The experimental conditions differ, therefore, from those usually found in commercial electroplating practice, in the following manner:

1. All specimen transfer operations were carried out in an inert atmosphere substantially free of oxygen and moisture.

2. Final cleaning (oxide removal) operations were performed using high vacuum techniques, rather than the usual commercial cleaning and pickling cycles.

3. Plating was performed under oxygen free conditions, with short plating cycles (20 coulombs, equivalent to 550 Å of nickel) so as to form nickel deposits of the same order of thickness as the surface films being studied. Thicker deposits would have masked the effects being studied during deposition.

4. Equipment limitations forced the employment of a long (4 minute) preplating soak of the specimen in the nickel plating bath.

The results obtained using the techniques described may be summarized as follows:

1. Electrochemical reduction of copper oxide consumes a large share of the current under conditions studied. In the case of thinner films (< 650 Å), all of the oxide present at the start of plating may be removed by this mechanism.

2. Under the circumstances investigated, there appears to be little doubt that where oxide films thicker than 650 Å are present at the start of plating, appreciable quantities of oxide remain on the specimen after plating

(presumably under the nickel plate), the amount increasing with the original thickness of the oxide film. For oxide thicknesses greater than 1650 Å (at the start of plating) the amount of oxide left after plating becomes directly proportional to initial oxide thickness.

3. When oxidized copper cathodes are allowed to soak in the Watts bath prior to plating, even at high pH values^(5.0-5.2), significant oxide dissolution occurs, producing a cathode film rich in copper ions.

4. These copper ions codeposit with the first layer of nickel deposited, producing an initial layer of copper-nickel alloy.

5. Current efficiency, as a function of initial oxide thickness, has been determined for the several electrode processes, i.e.:

- (a) Reduction of cuprous oxide
- (b) Co-deposition of copper ions
- (c) Nickel deposition

6. A five-fold change in current density (from 10-50 amp/ft²) appears to be without significant influence on any of the above electrode processes.

Microfilm \$2.50; Xerox \$6.20. 131 pages.

INTERFACIAL RESISTANCE TO EVAPORATION

(L. C. Card No. Mic 59-5186)

William J. Heldeger, Ph.D.
Princeton University, 1959

In this dissertation, the application of an unsteady state technique to the measurement of vapor pressure and rate of evaporation under reduced pressure is described. Vapor pressure was determined from the effusion rate through an orifice smaller than the gaseous mean free path; effusion and evaporation rates into a closed volume were calculated from the pressure change. This is the first precision rate determination employing the unsteady state technique, made possible by refinement of a previous application of this method to permit continuous precise recording of an electronic pressure signal and by the use of a very large reservoir volume to reduce the rate of pressure change to a readily measurable quantity. Although the vapor pressure has seldom been determined in the measurement of evaporation rates, in this investigation both were measured under similar conditions in the same equipment and by the same technique, which is probably the first time this method has been applied to a vapor pressure determination.

Extreme precautions were taken to ensure the purity of the evaporating liquid, both in the initial purification and for the prevention of subsequent contamination. The results obtained indicate that very pure glycerol evaporates into a vacuum at a rate which is only five percent of the maximum kinetic theory rate based on the measured vapor pressure over the temperature range 14° to 26°C. The demonstration that this low observed evaporation rate is not limited by heat transfer or impurity complications provides the first reliable evidence of an interfacial resistance to evaporation.

Observations based on the temperature dependence of effusion rate permitted the calculation of an approximate heat of vaporization for glycerol of 15 k calories/gram

mole, a value in sharp disagreement with previous literature on the subject. The adsorption of glycerol on a metal surface was studied qualitatively and the conclusion reached that the very rapid adsorption observed could be explained in terms of vapor molecules in a more reactive condition than in the equilibrium vapor. This condition is postulated to be the lack of internal hydrogen bonds where such exist in the equilibrium state.

Microfilm \$2.50; Xerox \$3.80. 69 pages.

AXIAL MIXING OF LIQUIDS FLOWING THROUGH PACKED BEDS

(L. C. Card No. Mic 60-763)

Arthur William Liles, Ph.D.
The Ohio State University, 1959

Axial mixing or longitudinal diffusion coefficients for water flowing through glass bead packings are measured in this investigation by means of the frequency response technique. This technique utilizes the response of the packed bed to a sinusoidal concentration variation in the inlet stream. The bed mixing process causes a decrease in amplitude and phase shift in the concentration wave as it passes through the bed. From the magnitude of these effects, axial mixing coefficients may be determined.

This investigation showed that there is no apparent effect of length on axial mixing coefficients. It was shown that effects of length on axial mixing coefficients could be produced by replacing packed analytical sections with void analytical sections. It was concluded that these were the causes of the length effect observed by previous investigators.

Agreement between experimental and calculated residence times, sinusoidal outlet concentration curves, and lack of frequency effect on axial mixing coefficients indicated that both the theoretical and experimental techniques were satisfactory. The effects of particle size were investigated and tended to indicate an increase in axial mixing coefficients with a decrease in particle diameter.

All results were in general agreement with those of other investigators. The range of the interstitial velocity investigated was from 0.39 to 4.15 cm./sec. The corresponding values of the axial mixing coefficient, in cm.²/sec., varied from 0.39 to 3.53 for 6.13 mm glass beads; 0.33 to 1.52 for 3.12 mm glass beads; and 0.05 to 0.42 for 0.47 mm glass beads. Corresponding Reynolds numbers were in the range 0.8 to 117, while Peclet numbers varied from 0.27 to 0.74.

Data were also obtained for porous alumina pellets; however, attempts to use methods of previous investigators to interpret the data revealed that questionable assumptions were involved. Two methods were proposed for interpreting data of this kind.

Theoretical equations predicting the frequency response of a packed bed of dissolving pellets were developed. Also, equations predicting the response of a packed bed of porous spheres, which were assumed to be representable by the Wheeler Model of a porous sphere, were derived and solved.

The equipment utilized to generate the sinusoidal concentration consisted of four single action, positive

displacement pumps. These were operated off a cam driven by a variable speed motor. The analytical apparatus measured the absorption of ultraviolet light by the 2-naphthol flowing through the analytical grating in the column. Phototubes were used to determine the amount of ultraviolet light passing through the analytical grating. The outputs of the phototubes were recorded on a strip chart recorder. The trace element, 2-naphthol, was present in distilled water in ppm.

Microfilm \$2.50; Xerox \$8.40. 181 pages.

A STUDY OF ESTERIFICATION RATES ON TREATED BAUXITE CATALYSTS

(L. C. Card No. Mic 60-764)

Roland Gray Lindsey, Ph.D.
The Ohio State University, 1959

Analysis of the data based on the common Langmuir-Hinshelwood mechanisms did not produce a correlation of the data. Assuming that the reaction sites are heterogeneous with regard to the energy of adsorption for each component in the reaction, it can be shown theoretically that the activity terms- a_j - in the adsorption isotherms should be replaced by a_j^n . A rate equation based on a surface reaction rate controlling mechanism employing this modification was adequate for correlating the rate data with an average deviation of ± 5 per cent and a maximum deviation of 11 per cent. It was also possible to correlate related rate data obtained by Fitz and Sashihara by using the same general modification of the Langmuir isotherm.

The purpose of this work was to help in the development of techniques useful for an engineering analysis of the rates of heterogeneously catalyzed vapor phase reactions.

In this respect, rate data were developed for the esterification of acetic acid and n-hexanol over a manganese oxide treated bauxite catalyst at 206°C. The experimental work covered a range of hexanol:acetic acid molar ratios of 3.00-0.33 at pressures of 1.0-0.25 atmospheres and catalyst weight to molar feed rates of 20-250 gm/gm mol per hour. The resulting conversions ranged from 10-80 per cent of the limiting reactant in the feed mixtures.

In preliminary studies on bauxite over a range of temperatures from 206-255°C, it was found that the untreated bauxite catalyst underwent a continuous, gradual loss of activity for the esterification of ethanol, butanol, hexanol, and octanol. Limited data on equimolar feed mixtures of these alcohols with acetic acid showed a uniform increase in reaction rate as the homologous series of alcohols was ascended; octanol gave rates about three times those for ethanol.

A series of bauxite catalysts impregnated with metal oxides was prepared; each one was prepared to contain 0.4 gram atoms of metal per 1000 grams of bauxite. The catalysts were evaluated at 1 atmosphere pressure at 206°C using equimolar feeds of n-hexanol and acetic acid. The metals used were W, Mo, B, Th, Ce, Cr, Mn, and Ni, giving relative activities in this order. Compared with untreated bauxite, the relative activities ranged from 4.5 for tungstic oxide to 0.52 for nickel oxide treatments.

For short processing periods of 6-8 hours, the loss in

activity per hour ranged from 0.14 per cent for manganese to 1.84 per cent for molybdenum oxide treatments; there did not appear to be any uniform relationship between the relative activity and the short process period decay rates.

Microfilm \$2.50; Xerox \$8.20. 176 pages.

PREDICTION OF EQUILIBRIA FOR RARE EARTH NITRATE-NITRIC ACID-TRIBUTYL PHOSPHATE SYSTEMS

(L. C. Card No. Mic 60-591)

Roman Uhrich Schoenherr, Ph.D.
Iowa State University of Science and Technology, 1959

Supervisor: Morton Smutz

A study was made of the equilibrium extraction into tributyl phosphate of the neodymium nitrate-samarium nitrate-nitric acid system. The purpose of this study was not only to evaluate the extraction properties of this system, but also to develop methods of correlating and of predicting equilibrium phenomena which were reliable and also would be applicable to other rare earth nitrate-nitric acid systems.

The extraction properties of the neodymium nitrate-samarium nitrate-nitric acid system were evaluated by means of single stage equilibrium extractions performed on various mixtures of these solutes. From correlations of the equilibrium data from these extractions based on the molar composition and the total molality of the solutes in the organic phase a general similarity was observed between the neodymium nitrate-nitric acid system and the samarium nitrate-nitric acid system. From this similarity it was concluded that the methods of data correlation used for these rare earth nitrate-nitric acid mixtures would also be applicable in the study of the extraction properties of the other trivalent light rare earth nitrates.

The equilibrium distribution of neodymium nitrate-nitric acid mixtures and of samarium nitrate-nitric acid mixtures was found to be approximated by the distribution of pure nitric acid. The distribution coefficients for neodymium nitrate-nitric acid and for samarium nitrate-nitric acid mixtures were evaluated as a function of the composition and total molality of the organic phase. A method was shown for evaluating the distribution coefficients for neodymium nitrate-samarium nitrate-nitric acid mixtures from the distribution coefficients of the pure rare earth nitrate-nitric acid mixtures.

The variation of the samarium nitrate-neodymium nitrate separation factors was shown as a function of the total molality of the organic phase. The variations of the nitric acid-neodymium nitrate and the nitric acid-samarium nitrate separation factors were shown as a function of the composition and total molality of the organic phase. The variations of these separation factors were explained by consideration of the mechanism by which the rare earths and nitric acid are extracted. A method was shown for evaluating the nitric acid-rare earth nitrate separation factors for neodymium nitrate-samarium nitrate-nitric acid mixtures from separation factor data for mixtures of nitric acid and the pure rare earth nitrates.

A method for the prediction of equilibrium phenomena

for multicomponent extraction systems was developed. This method was demonstrated by means of a sample calculation to predict the equilibrium concentration and composition of each phase for a hypothetical neodymium nitrate-samarium nitrate-nitric acid mixture using equilibrium distribution and separation factor data for this rare earth nitrate-nitric acid system.

Microfilm \$2.50; Xerox \$4.80. 92 pages.

ENGINEERING, CIVIL

UNSTEADY-STATE PHENOMENA IN THE FLOW THROUGH POROUS MEDIA

(L. C. Card No. Mic 59-6888)

Roger Jerome Marie De Wiest, Ph.D.
Stanford University, 1959

Two cases of unsteady-state flow in homogeneous porous media are investigated, one in a confined aquifer with radial symmetry and one dealing with a free surface flow. Whereas time transients in the first case exist only because of the compressibility of the aquifer, the unsteady phenomena in unconfined flow, where the compressibility of the medium is negligible, are inherent to the disturbance of the free surface.

In the confined flow problem, an expression is derived giving the variation of head in function of time and the physical constants of the aquifer, in the period occurring after a well with constant head at its circle of influence is pumped at a constant discharge.

The main body of this dissertation is intended to be an original contribution to the study of unsteady free surface flow through a dam or levee with a horizontal underdrain. An analytical treatment is given to the problem of the establishment of the flow through such a dam or levee when the head behind it is gradually raised and then kept at a constant value. The essential idea employed in the theoretical method is to consider the unsteady flow as a perturbation in time of the final steady flow. The unsteady potential $\phi(x, y, t)$ is expanded in a power series of $e^{-\lambda t}$, of the form

$$\phi(x, y, t) = \phi_0(x, y) + \phi_1(x, y)e^{-\lambda t} + O(e^{-2\lambda t})$$

where $\phi_0(x, y)$ is the known steady state potential and $\phi_1(x, y)$ is a perturbation potential.

It is shown that ϕ_1 satisfies Laplace's equation $\nabla^2 \phi_1 = 0$ in a dimensionless hodograph plane. The free boundary condition is linear but complicated, containing the eigenvalue λ , which is fixed by a determinantal equation. The amplitude of the displacement of the free surface is left undetermined; only the mode of the motion and the eigenvalue λ are computed. It is felt that further investigations may lead to the relation between the unknown amplitude and the speed at which the water level behind the dam rises. The boundary value problem corresponding to a sudden rise of the level behind the dam is set up mathematically.

Numerical examples of both the confined and unconfined flow problems are worked out.

Microfilm \$2.50; Xerox \$4.00. 73 pages.

CALCULATION OF AXIAL STRESSES IN SPACE FRAMEWORKS BY THE METHOD OF BAR-FORCE RELAXATION

(L. C. Card No. Mic 59-6375)

Chuan Chung Feng, Ph.D.
University of Missouri, 1959

Supervisor: Adrian Pauw

Relaxation methods were originally developed to provide a means of calculating the axial bar stresses in highly redundant pin-jointed space frames without the need for a formal solution of a large number of simultaneous equations. The application of the method, however, is limited by the slow rate of convergence of the residual unbalanced forces which must be liquidated. In highly redundant frames the relaxation process is further complicated by the multiplicity of the force-transmission paths. The effectiveness of the basic relaxation process depends primarily upon the judgement and experience of the computer.

This dissertation develops the basic philosophy of controlled over-relaxation as applied to the problem of space frame analysis. The analysis is limited to the solution of axial bar forces. Structural parameters are expressed in matrix form. The study has purposely been limited to space frames using third order matrices. The analysis of plane frames may be considered as a special case and only second order matrices would be required. Only a knowledge of the three basic matrix operations: addition, multiplication and inversion, are assumed.

By expressing bar- and joint-force components as matrix elements, the bar stresses may be computed directly from the external joint forces by the use of matrix algebra. The parameters, bar stiffness and joint stiffness, are derived from the geometry of the frame and the elastic properties of the bars. These parameters together with the conditions of joint stability and of equilibrium define a bar-force distribution matrix in a manner analogous to the moment distribution factor used in the "moment distribution" method. By means of this matrix, external joint loads can be distributed directly as residual unbalanced forces to the adjacent joints. The "sequence summation" concept has been extended to matrix form to permit automatic liquidation of these residuals by an over-relaxation technique. In the bar-force over-relaxation process, the residual bar-force components are simultaneously liquidated in a single relaxation cycle by the use of a bar-force over-relaxation influence matrix. For singly-connected joints, a joint-force over-relaxation influence matrix may be obtained directly from the bar-force over-relaxation matrices for bars framing into a central joint. When joints are multiple-connected the problem is more complicated. Partial joint-force over-relaxation matrices are employed to separate the transmission paths into "loops." Triangular and rectangular panels have been considered since they are the basic forms normally used in space frames. Panel joint-force over-relaxation influence matrices may be derived by solving a set of simultaneous linear matrix equations so as to produce simultaneous equilibrium at all joints in the panel. When the total number of free joints is equal to the number of matrix equations, the use of such a matrix yields a direct solution for the bar forces. For multi-level space frames, each level may be considered as a panel in which all the joint forces can be balanced in

single relaxation cycle by the use of an appropriate panel joint-force over-relaxation influence matrix. The residuals transmitted to adjacent panels are then liquidated by successive relaxation between levels. The complexity of the solution of multi-level structures is greatly reduced by this technique.

Five illustrative examples have been presented to demonstrate the application of the theory developed. A number of self-checking features have been incorporated into the analysis. Since several loading conditions must generally be considered in a structural design, the use of influence coefficients obtained by the "unit-force problem" is also described. An important feature of the analysis proposed in this dissertation is that it lends itself to a high degree of standardization of the computational steps required for a solution.

Microfilm \$2.50; Xerox \$8.20. 180 pages.

INTERACTION OF FLAT SLABS AND COLUMNS

(L. C. Card No. Mic 60-533)

Manubhai N. Patel, Ph.D.

Michigan State University, 1957

The purpose of this thesis is to study the interaction between columns and flat slabs. By giving some angular rotation at one interior column joint when all the remaining column joints are fixed against rotation, the stiffness of the slab can be determined. When the stiffness of the slab is known, the flat slab structure can be divided into distinct indeterminate frames.

A stainless steel plate of square panels is taken to represent a flat slab. A known moment is applied to one of the interior column joints of the slab, keeping all the far end column joints fixed against rotation. The deflections of the slab due to this moment are measured by means of the Gaertner Filer micrometer microscope. The angular rotation at the column joint due to the applied moment is also determined from the deflection of a pointer attached to the column joint. The ratio of the applied moment to the angular rotation is the stiffness of the flat slab.

The deflections of the slab due to a known moment at the interior column joint are also determined by solving the plate equation by the relaxation process. The moments on the transverse sections are determined by means of finite difference equations from the deflections obtained by the relaxation method. The moments around the column capitals are also evaluated and compared. The column capital on the longitudinal direction through the column where the moment is applied takes a considerably larger moment than any of the remaining columns.

From the moments on all the transverse sections, an equivalent beam is developed. The stiffness of this equivalent beam is found to be about 2-1/2 per cent larger than the one obtained from the deflections of the slab by the relaxation process. The stiffness of the slab obtained from the experimental results is about 8 per cent larger than the stiffness of the equivalent beam. An equivalent loading for a uniform load on the slab is developed for the fixed-end moments by using the deflection values of the slab obtained by the relaxation method. The fixed-end moments obtained by loading the equivalent beam with the equivalent

loading are found to be about 15 per cent larger than the moments determined by using the deflection values obtained by the relaxation process.

Microfilm \$2.50; Xerox \$5.40. 106 pages.

STRENGTH IN SHEAR OF PRESTRESSED CONCRETE I-BEAMS

(L. C. Card No. Mic 60-595)

David Alan VanHorn, Ph.D.

Iowa State University of Science and Technology, 1959

Supervisor: C. L. Hulsbos

It is the purpose of this paper to present a method for evaluating the shear strength of pre-tensioned prestressed concrete I-beams having no end blocks. Shear strength, as used in this paper refers to the resistance of the beams to failure by shear. A shear failure is defined as a failure which is initiated by an inclined tension crack resulting from the combined effects of cross shear and bending moment. Some writers refer to shear strength as the ultimate strength of the beam when the failure mechanism is started by the formation of inclined cracks. But, in this paper, shear strength is defined as having been reached when a sudden, inclined tension crack completely traverses the web of the beam, and ultimate strength as having been reached when the beam will support no more applied load.

In previous research, the approach to the problem of determining shear strength has been through formulation of empirical equations which most nearly agree with experimental findings. In this work, a more general approach is presented, involving the determination of principal stresses produced in the beam, and a comparison of these stresses with limiting stresses dictated by a theory of failure for the concrete.

In this study, 33 pre-tensioned I-beams were tested to failure in such a manner that the failure mechanism was initiated by a sudden inclined tension crack which completely traversed the web. All of the beams had the same cross-section and were prestressed with 3/8-inch, seven wire, steel strand. The cross-section was symmetric with respect to horizontal and vertical axes. The depth was 18 inches, the web thickness was 4 inches, and the flange widths were 9 inches. None of the beams had end blocks. The variables introduced in the study were (1) amount of web reinforcement, (2) prestress stress distribution, (3) length of shear span, (4) length of overhang at the supports, and (5) concrete strength at time of release of the prestressing steel.

After the loads which produced the shear failures in the beams were determined, the principal stresses were evaluated at a number of points in each beam. The factors which were considered in the evaluation were (1) the cross shear and bending moment caused by the applied load, (2) the direct compressive force produced by the prestressing steel, (3) the stress conditions in the anchorage zone caused by build-up of the prestressing force through bond, and (4) the local effects of the end reactions and applied concentrated loads. Stress trajectories were plotted in the web section for each of the test beams. The

actual shear cracks were compared with the stress trajectories, and the maximum principal tensile stresses computed were compared with the ultimate tensile strength and modulus of rupture of the concrete.

For all of the test beams, agreement between the direction of the inclined tension crack and the computed stress trajectories was good. In all but eight of the beams, the inclined tension crack passed through or near to the point at which the maximum principal tensile stress was computed. In six of the eight exceptions, the failure mechanism was started by the formation of flexure cracks rather than the inclined tension cracks.

It was concluded (1) that the combined stress method can be used satisfactorily to evaluate the shear strength of pre-tensioned I-beams having no end blocks, (2) that in the evaluation of shear strength, the maximum-normal-tensile-stress theory is a satisfactory theory of failure for concrete, and (3) that the possibility of a shear type failure is greater in the end portions than in the center portion of pre-tensioned I-beams having no end blocks.

Microfilm \$2.50; Xerox \$6.20. 128 pages.

ENGINEERING, ELECTRICAL

EVALUATION OF THE SPEECH CHANNEL DIVORCED FROM TALKER-LISTENER INFLUENCE

(L. C. Card No. Mic 60-57)

Denmer Dix Baxter, Sc.D.
Washington University, 1959

Chairman: Doctor Bernhard E. Keiser

The dissertation presents a successful attempt to divorce the evaluation of the speech channel from the influence of the talker-listener articulation test group. The method developed assumes that the phoneme articulation test message is an ergodic sequence of phonemes, phoneme combinations, or symbols with an ergodic range of zero; that is, the occurrence of any symbol is an independent event governed only by the constant probability of the event. Although explicitly developed for speech channel evaluation, the method is applicable to any discrete information channel without memory driven by an information source possessing a null ergodic range.

The research is based upon the supposition that the characteristics of the talker and the listener remain invariant with respect to time and speech fidelity and may be defined by the forward transition probability matrix, which is the array of conditional probabilities of the output symbols when the input symbol is specified. The evaluation of several speech channels is preceded by a thorough discussion of the properties of the forward transition probability matrix (hereafter referred to as transition matrix).

The method presented demands the confusion matrix display of the results of a two part articulation test performed by the talker-listener group. The first part establishes the transition matrix of the generalized talker and of the generalized listener, and is performed with the speech channel replaced by a perfect channel in which no

errors, or confusions, can occur; the second part establishes the transition matrix of the speech channel, and is performed upon the speech channel.

The transition matrix of the speech channel is obtained by premultiplying the confusion matrix resulting from the second part of the test by the inverse of the talker's transition matrix, and then postmultiplying by the inverse of the listener's transition matrix. The data supporting the method have been sufficient to show that the transition matrix of the speech channel is insensitive to the division of error between the talker and the listener. Thus, the listener may be charged with all the error so that the transition matrix of the speech channel is given by the second confusion matrix postmultiplied by the inverse of the first confusion matrix.

Microfilm \$2.60; Xerox \$9.00. 199 pages.

CHARACTERISTICS OF THE TIME RESPONSE OF A NETWORK AS DETERMINED BY ITS TRANSFER FUNCTION

(L. C. Card No. Mic 58-7210)

John D. Brulé, Ph.D.
Syracuse University, 1958

Supervisor: Norman Balabanian

This dissertation considers two aspects of the general problem of relating the transfer function of a network to its time response characteristics. The first topic treated is an evaluation of the step and impulse responses of a network whose transfer function has negative real poles. The effects of the location of the zeros of this type of transfer function are studied by determining the relationships between the number of real zeros of the transfer function, and the number of zero crossings of the step and impulse response of the network. It is shown that if the transfer function has n finite zeros, all on the positive real axis, then the step response of the network has exactly n zero crossings. This result is extended to the impulse response of the network. Upper and lower bounds are found on the time of the zero crossing for the case $n = 1$. A transfer function with complex zeros is considered for the case of one pair of such zeros in the right half plane. It is shown that if the imaginary part of these complex zeros is greater than a certain lower bound, then the step response of the network will have no zero crossings. This lower bound is expressed in terms of the coefficients of the denominator polynomial of the transfer function, its order, and the real part of the complex zeros.

The second topic considered in this dissertation is the problem of obtaining the Laplace transform of a prescribed impulse response, under the constraint that this transform must be a realizable rational function. In general, the solution of this problem requires that approximations be made, either in the time domain or in the frequency domain. This problem has been studied by many investigators, and several solutions have been developed. In this dissertation, a procedure is developed which provides a systematic method for improving the approximation by making small changes in the poles and residues of the transfer function. The effects of such changes on the impulse

response are evaluated by means of a Taylor series expansion of the impulse response. It is shown that only the first two terms of this expansion provide a reasonably accurate estimate of these effects. A set of normalized curves are prepared which allow the designer to determine how a given pole or residue should be changed in order to improve the approximation in the time domain. The procedure is demonstrated by applying it to a numerical example. Microfilm \$2.50; Xerox \$4.20. 78 pages.

A MICROWAVE DETECTOR USING A RESISTIVE-WALL ELECTRON BEAM TUBE

(L. C. Card No. Mic 60-423)

Peter Salvatore Castro, Ph.D.
Northwestern University, 1959

Chairman: R. E. Beam

SUMMARY

A substantially new method for the detection of r-f signals is presented. The r-f signal is used to velocity modulate an electron beam and the beam is then allowed to diverge in an essentially field-free space. The diverging electron beam is then collected by means of a resistive-wall cylinder. An incremental d-c voltage which is proportional to the square of the r-f beam modulating signal is developed along the length of the collector.

The analysis of the detection action proceeds in two parts. The first part consists in expanding the transfer curve of the d-c output voltage versus the d-c velocity of the electron beam in a Taylor's series and using the second derivative term to find the detected voltage. This is a quasi-static analysis and is valid only for small transit angles of the electron beam. The second part extends this analysis to large transit angles by a treatment of space-charge wave propagation in the electron beam. This treatment shows the existence of exponentially decaying waves in a diverging electron beam.

Experimental verification of the salient points of the theory is presented. In addition, an experimental investigation of the use of the resistive-wall detector tube as a traveling-wave amplifier with an accelerating or decelerating field in the interaction space is presented.

Microfilm \$2.50; Xerox \$4.80. 93 pages.

CONTROL SYSTEM DESIGN BASED ON THE END SIGMA ERROR CRITERION

(L. C. Card No. Mic 60-59)

John Wallace Diesel, Sc.D.
Washington University, 1959

Chairman: Professor John Zaborszky

The design of automatic feedback control systems is often hampered by the lack of a systematic method of synthesis. Various techniques available for analyzing special

features of the system response are frequently used on a piecemeal basis with much reliance on both experience and intuition. The present investigation attempts to develop a unifying design philosophy to provide a framework within which the design effort can be carried out in an organized and directed manner.

This philosophy is based on the use of a single index of performance for synthesizing, analyzing, and comparing system response. Specifically the end sigma criterion is chosen because it yields a realistic measure of system quality in most applications, and because its mathematical simplicity results in a general applicability to many practical control problems. The end sigma error, proposed by Zaborszky and Diesel,¹ is defined as the expected value of the squared error averaged over the actual times of utilizing the system output. The results of the present investigation can be briefly described as providing means for evaluating this criterion for linear time-invariant control systems, and providing an explicit solution for the system minimizing the end sigma error for a specified control problem.

In order that these results be meaningful, the methods developed permit evaluation of the criterion as an average over the actual input signals to the system, so that the end sigma error truly summarizes the performance of the control system in a given application.

In many present day control applications such input signals consist of combinations of random and deterministic signals. The resulting complexity of the problem therefore justifies the use of high speed digital computers. For this reason the mathematical relations are given in a form ideally suited to the use of such equipment.

Techniques are determined for handling both continuous and sampled data systems. Also the basic computer programs are sufficiently general that they cover a wide range of practical and complex control problems. It is therefore believed that the investigation provides means for solving many important engineering problems of a complexity which has heretofore prevented systematic analysis. Microfilm \$2.50; Xerox \$4.60. 88 pages.

- (1) Zaborszky, John., Diesel, J. W., "Probabilistic Error as Measure of Control System Performance," A.I.E.E. Transactions, vol. 78 (1959).

ON ELECTRO-THERMO-MECHANICAL TRANSIENTS IN CYLINDRICAL CONDUCTORS SUBJECTED TO AXIAL ELECTRIC FIELDS

(L. C. Card No. Mic 60-430)

Robert Carl Geldmacher, Ph.D.
Northwestern University, 1959

Advisers: John A. M. Lyon
Abraham Charnes

A continuing interest has existed over the years in the study of the heating of current carrying conductors. Recently, the "exploding wire phenomenon" has given added impetus to study in this field.

In the present work the ambient to melting phase of this problem has been examined from the standpoint of

intercoupled electrical, thermal, and mechanical effects in order to establish the foundations for a theoretical solution, and to establish the intervals over which the solution is valid. Thermoelectric and electromagnetic effects were considered relative to their influence on the distribution of temperature and electric field within the conductor. Body forces resulting from the electromagnetic field were also considered and the corresponding stresses worked out.

In order to formulate the problem in a way that was mathematically tractable it was reduced to the case of electrothermal coupling through temperature dependent electrical conductivity. Solutions were obtained by means of a method which has not been previously applied to problems of this kind and intervals over which the solutions are applicable are prescribed. With this method, solutions to particular problems may be obtained which do not appear in the literature. General solutions have been obtained for conditions of no heat loss at the boundary, radiation at the boundary (Newton's law of cooling), and the boundary fixed at the initial temperature.

Various examples of engineering interest have been worked out and the results are compared with solutions obtained assuming constant electrical conductivity. Differences of 20 and 30 percent and more may exist between melting times as predicted by the two methods.

It has been found that significant electromechanical body forces may be present under certain circumstances. These body forces may play an important part in the break up of wires subjected to large suddenly applied fields.

Microfilm \$2.50; Xerox \$5.00. 97 pages.

A STUDY OF THE PHASE PRINCIPLE OF SIGNAL DETECTION

(L. C. Card No. Mic 60-486)

Euyen Gott, D.Eng.

The Johns Hopkins University, 1959

The research reported in this paper is an extension into the frequency domain of the works of W. H. Huggins and D. Middleton on the phase principle of signal detection.

A theoretical investigation of the zero-zone spectral distribution of the output power is made from the statistical point of view. To facilitate the analysis, the theory of complex Gaussian processes is explored. As a result, a new expression for the 2n-variate probability density function, incorporating complex covariance matrices and determinants, is introduced. This new expression was proved with the help of a theorem and three corollaries on determinants which are proved in the appendix.

In order to take advantage of the theory of complex Gaussian processes, a complete system of complex variables and functions, representing narrow-band noise, filter networks, and covariances is developed. The applicability of these complex representations is based on the fact that a narrow-band noise satisfies the definition of a complex Gaussian process.

By using the aforementioned tools, the expression for the zero-zone power spectrum of the phase sensitive detector is found with the saving of a large amount of labor.

Experimental equipment of the phase sensitive detector plus an input system and a measuring system are described

and recordings of the zero-zone power spectrum for various input conditions are made.

Microfilm \$2.50; Xerox \$5.60. 112 pages.

TRANSFER FUNCTIONS OF TWO-PORTS WITH PRESCRIBED LOAD

(L. C. Card No. Mic 58-7224)

(John) Chang Soo Kim, Ph.D.
Syracuse University, 1958

The topic of this dissertation is to investigate the conditions for the physical realizability for transfer functions of a terminated two port network, and to examine how such a network can be synthesized from the given transfer function. The two port network is assumed to be terminated in an arbitrarily prescribed load. However, since the problem of investigating general transfer function with RLC elements is very complex, the emphasis is placed on LC networks. In addition to this, the behavior of the phase of the transfer function (on the $j\omega$ axis) is studied. Methods of approximating a given linear phase function by a realizable one are investigated. One of these studies is applied for two ports terminated in an arbitrarily prescribed load impedance. Furthermore, an investigation is made of possible improvements on matching with an LC corrective network when the frequency dependence of phase function is given.

A typical transfer function may be expressed in terms of the short circuit output admittance, y_{22} , the short circuit transfer admittance y_{12} , and the load admittance $Y_L = \frac{q_L}{p_L}$ as

$$Y_{1L} = \frac{y_{12} Y_L}{y_{22} + Y_L} = \frac{q_{12} q_L}{p}$$

In order for Y_{1L} to be a physically realizable transfer function, the following condition must be satisfied.

1. Y_{1L} is a rational function of generalized frequency s .
2. The denominator of Y_{1L} is a Hurwitz polynomial (where a Hurwitz polynomial may have zeros on the $j\omega$ axis).
3. The degree of the numerator of Y_{1L} may be at most one degree higher than that of the denominator. (This will happen only if Y_L has a pole at ∞ or $Y_{1L} = \infty$.)
4. The locations of zeros of Y_{1L} are not limited except that they have mirror (conjugate) symmetry with respect to the real axis.

The presence of the prescribed load Y_L provides further restrictions on a transfer function as follows.

1. The numerator of Y_{1L} must contain all the zeros of y_{12} and Y_L except in the degenerate cases.
2. From the given Y_L and the denominator of Y_{1L} , a positive real function y_{22} must be capable of derivation.

From the above conditions, the numerator of y_{12} and Y_L can be obtained from the given Y_{1L} except in some of the degenerate cases. Then the realizability condition of Y_{1L} can be transformed into the realizability condition for obtaining a positive real function y_{22} from the given p . It is not always possible to find the condition in the case of an RLC network, and only in LC network can this condition be found.

In order to synthesize a network which provides a prescribed phase, it is necessary to develop the transfer function whose phase approximates the prescribed phase. In this dissertation, two approximations for a linear phase characteristic are given.

The first linear phase approximation is obtained by using the transformation $z = \sinh^{-1}s$ and placing evenly spaced linear charges on the $x = a$ ($z = x + iy$) line in the potential analog term. The second linear phase approximation is obtained by identifying the zeros and pole of the tangent function of phase with the zeros and poles of the network functions. Here the network function is a reactance function in an LC network and the sum of its numerator and denominator becomes the denominator of the approximated transfer function Y_{IL} .

In the above approximation, the multiplying factor and the quadrant zeros of Y_{IL} do not contribute on the frequency dependent part of the phase function. This results in a degree of freedom which can be used to improve the power transmission, to the load.

Microfilm \$2.50; Xerox \$4.80. 94 pages.

THE NATURE AND BEHAVIOR OF REDUNDANCY NETWORKS AND FUNCTIONS

(L. C. Card No. Mic 60-382)

Fred Moskowitz, Ph.D.
Syracuse University, 1959

Supervisor: F. Reza

Various properties and characteristics of probabilistic redundancy networks and functions which can be used to represent reliability relationships in complex equipment containing redundant elements, large scale systems containing a multiplicity of alternative subsystems, or telecommunication nets containing possibilities of alternative routing, are presented. By making the simplifying assumptions that all elements of a system have independent failure statistics and that the reliability of an element remains unchanged when it is incorporated into a system, a simple algebra can be used by means of which the analysis of such redundancy networks becomes possible.

The behavior of a redundancy network functions with one degree of freedom is examined in detail. The restriction that all element reliability values in a system be identical permits a study of the behavior of the network function in a general way without the necessity of analyzing specific circuit configurations. The physical significance of the canonical formulation is discussed and a systematic method for the evaluation of the canonical coefficients is presented. The System Reliability characteristic curve and the Shannon-Moore Inequality is used to develop methods for the design of redundancy networks which satisfy arbitrary system reliability tolerance specifications. For this purpose a complete minimum generating set of 2-terminal building block networks of five elements or less is tabulated with their network functions, canonical coefficients, and crossover points. It is shown that by the proper choice of building block networks and their appropriate combinations the crossover point can be located wherever desired. By iterative self composition it is then possible to meet specified tolerances.

It is shown that any finite polynomial of one variable, satisfying certain quasi-realizability conditions, can be represented by a 2-terminal redundancy network whose network function most closely approximates the polynomial in the sense of the mean square difference.

Those systems which are characterized by having the least possible network constraints can be represented by cumulative binomial distribution functions. The significance and properties of such binomial network functions are explored.

Finally, the statistical basis for redundancy networks and functions is given, permitting a more precise definition of reliability. In addition to reliability and unreliability, such related functions as "hazard," "safety," and "mortality distribution" is introduced; and such attributes as "mean-time-to-failure" and the standard deviation of the mean-time-to-failure are defined and related to reliability. It is shown that when these statistical functions and attributes for the elements are known it is possible, through the redundancy network function, to deduce them for the system.

Microfilm \$3.20; Xerox \$11.25. 247 pages.

PULSE WIDTH CONTROL OF SAMPLED DATA SYSTEMS

(L. C. Card No. Mic 60-19)

Winston L. Nelson, Ph.D.
Columbia University, 1959

The use of pulse width control for the on-off regulation of systems subject to sampled data is investigated in this paper. The pulse width controller is considered to effect control of a linear n^{th} order plant by applying to the plant during each sampling period an input signal, selected from the restricted class of pulse width control signals, and based on the state of the plant at the sampling instant.

The basic capabilities of this type of control are investigated in relation to simple on-off, or relay, control and in relation to pulse amplitude control. General methods for achieving both stable and optimal control are developed and practical design applications are considered. Examples and experimental evaluation of the design methods are also given. Microfilm \$2.50; Xerox \$7.40. 157 pages.

CONTROL SYSTEM SYNTHESIS AND STANDARD DESIGN FORMS

(L. C. Card No. Mic 60-449)

Endrik Noges, Ph.D.
Northwestern University, 1959

This dissertation covers some aspects of feedback control system synthesis and the use of standard design forms. In this connection four areas are investigated: 1) feedback control systems having frequency responses which approximate the "ideal" frequency response of constant gain and linear phase characteristics, or CGLP systems, 2) formulation of generalized standard design forms and their

correlation with the step-function response of the system, 3) systems with closed-loop transfer functions which contain one real zero, but are not of the zero-velocity-error type and 4) formulation of open-loop standard design forms.

The standard design forms of CGLP systems are developed by minimizing the error in the real part of the closed-loop transfer function. The frequency response as well as the transient response of CGLP systems is compared with those of other existing systems.

Generalized standard forms are proposed which give the closed-loop singularities in terms of the overshoot and the response time. The generalized standard forms for Tschebyscheff distribution of closed-loop poles are presented for systems up to the fifth order.

Systems whose transfer functions contain one real zero, but are not of the zero-velocity-error type, are studied from the viewpoint of minimizing the integral of time times absolute error (ITAE). Regions in which the closed-loop poles should lie for "best" time response are defined.

The open-loop standard design forms are formulated for systems having a feedback path transfer function which contains no dynamic terms. These standard forms relate the open-loop poles to the response time and to the overshoot of the system.

The standard forms which define the singularities in terms of the step-function response are found convenient in the design of linear systems. Their use enables the designer first to select an acceptable step-function response and then to proceed in a straightforward manner without reverting to trial and error methods.

Microfilm \$2.50; Xerox \$7.00. 148 pages.

BOUNDARY SOLUTION OF THE WAVE EQUATION

(L. C. Card No. Mic 60-551)

Richard James Reid, Ph.D.
Michigan State University, 1959

Major Professor: L. W. VonTersch

The solution of the wave equation subject to boundary conditions existing on irregularly shaped surfaces is obtained by assuming a solution function that is a truncated, n -dimensional Taylor's series about some point on the boundary or within the region where a solution is required.

The assumed series is of degree m_i ($i = 1, 2, \dots, n$) in each coordinate (i). There are then

$$\prod_{i=1}^n (m_i + 1)$$

coefficients of the series which are chosen to minimize the deviation of the solution function from the prescribed boundary values and also to minimize any residual remaining upon substitution of the assumed function into the wave equation.

The method of solution has the properties that:

- (a) the error of the solution can be estimated;
- (b) boundaries can be of any shape;
- (c) calculations for the eigenvalues and eigenfunctions of the solution can be made exclusively at coordinates of the boundaries;

- (d) the solution can be made to correspond to a least squares, Chebychev, or other type fit over the region of interest.

Microfilm \$2.50; Xerox \$3.00. 30 pages.

ENGINEERING, MECHANICAL

FACTORS INFLUENCING THE FATIGUE CHARACTERISTICS OF RUBBER-TEXTILE MACHINE ELEMENTS

(L. C. Card No. Mic 60-751)

Kenneth George Hornung, Ph.D.
The Ohio State University, 1959

Force Analysis

V-belt drives can be divided into three classes depending on the method used to maintain a desired tension in the belt. The three classes are (1) constant tension drives in which a known constant force is applied to each pulley in the drive, (2) locked center drives in which the location of the axis of each pulley in the drive is fixed in space, and (3) spring-loaded drives in which one pulley in the drive has movable sides which are held together by an axial spring.

In each drive type, two pure tensions exist in the belt at any point — one due to centrifugal force and another due to forces exerted on the belt by the pulley. The centrifugal tension can always be treated as separate from the pulley tension, and its effect on each type of drive is discussed.

For a constant tension drive in which the torque and pulley reactions can be measured, the force analysis is shown for a drive with two pulleys of equal diameter. Expressions are developed for the tight and slack side belt tensions in terms of the pulley torque, pulley radius, and pulley reaction.

The analysis of the forces in a locked center drive results in a graphical procedure for determining the running tensions in a drive in which the static no-load tension is known. An example showing the application of this method is shown.

A complete analysis of the forces and motions involved in the passage of a V-belt over a V-pulley is performed. Typical chart solutions to the resulting equations as obtained on an analogue computer are given, and the application of the analysis to a spring-loaded drive is shown. Spring forces for known belt tensions are computed and show good agreement with measured values.

Stress Analysis

A stress factor is defined which represents a measure of the severity of a given load on a given belt. Three stress factors are involved since the pulley forces, centrifugal force, and bending each impose a load on the belt. Each stress factor consists of a corrected nominal stress expressed as a percentage of the ultimate strength of the belt. Correction of the nominal stresses is necessary

because of the failure of the belt to conform to simplifying assumptions involved in the stress analysis. The correction coefficients are obtained empirically from belt life test data. The life test data also show that the stresses due to bending and those due to pure tension are not independent, and thus cannot simply be added to give a total stress. The data indicate that the effective bending modulus increases with increased tension. This is explained by the fact that slippage among cord fibers is retarded by interfiber friction which is a function of the tension on the cord.

Failure Theory

A plot of the stress factor versus the number of stress cycles at failure for a large number of belt life tests shows these quantities to be related by a straight-line function on semi-log graph paper. If there are i pulleys in a drive and the maximum stress factor at each pulley is denoted by $Q_1, Q_2, Q_3, \dots, Q_i$, then a cycle life can be computed for each Q , giving the values $N_1, N_2, N_3, \dots, N_i$. These individual cycle lives are assumed to be related to the total number of belt cycles at failure, n , by

$$n = \frac{1}{\frac{1}{N_1} + \frac{1}{N_2} + \frac{1}{N_3} + \dots + \frac{1}{N_i}}$$

Microfilm \$2.50; Xerox \$8.60. 188 pages.

THE SPECTRAL THEORY OF TURBULENT FLAME PROPAGATION

(L. C. Card No. Mic 60-451)

Louis Angelo Povinelli, Ph.D.
Northwestern University, 1959

Adviser: Dr. Allen E. Fuhs

This dissertation is concerned with turbulent flame propagation. An analytical formulation for large or small-scale, low-intensity turbulent flames is based on the distribution of eddy sizes present in the flow stream. The validity of several turbulent flame theories is checked as well as the reaction-zone-model criterion of Kovaszny, using a modified Powling type burner to produce a low-pressure stream of propane and air with small-scale, low-intensity isotropic turbulence. The basic assumption involved in the analysis is that the large-scale turbulence wrinkles the flame surface, thereby increasing the combustion area, but does not affect the laminar flame propagation rate. The small-scale turbulence is assumed to alter the laminar flame propagation by virtue of a change in the transport processes. Both effects are believed to occur simultaneously, producing an increase in the rate of flame propagation. The spectral theory weights the contributions of large and small eddies by considering the distribution of kinetic energy in the velocity fluctuations.

The experimental data obtained correspond to the upper limiting condition of the spectral theory, while published data are shown to fall close to a lower limit. In the former case, nearly all the eddies are of smaller or comparable size to that of the reaction zone thickness, whereas in the latter case, the scale is of larger size.

The Kovaszny parameter correlated the experimentally obtained data, correctly describing the reaction zone structure as observed during the testing. The turbulence intensity of ambient air behind a 3/32 inch mesh grid and an x/M position of 50.7, was found to decrease 70 percent as the pressure varied from one to 0.01 atmosphere. The experimental data of this study were found to be larger in magnitude than that predicted by the Scurlock-Grover theory, but consistent with the experimental results of Grover et al. This difference may be indicative of the effect of anisotropy on turbulent flame propagation. The ratio of turbulence microscale to laminar flame thickness did not appear to be a valid criterion for predicting the reaction zone structure.

Within the limits of the approximations made, the following general conclusions were made:

(1) The spectral theory correctly describes turbulent flame propagation for large or small-scale, low-intensity flames.

(2) The Kovaszny parameter accurately predicts the reaction zone structure for small-scale, low-intensity wrinkled laminar flames.

(3) Grid-generated turbulence intensity is strongly dependent on the pressure of the system.

(4) The ratio of turbulence microscale to laminar flame thickness does not constitute a sufficient measure for the prediction of the reaction zone structure.

Microfilm \$2.50; Xerox \$5.20. 105 pages.

ENGINEERING, METALLURGY

A STUDY OF THE OXIDATION MECHANISM IN COLUMBIUM-ZIRCONIUM AND COLUMBIUM-ZIRCONIUM-TITANIUM ALLOYS AT ELEVATED TEMPERATURES

(L. C. Card No. Mic 60-743)

Gerald Myron Gordon, Ph.D.
The Ohio State University, 1959

The present study was conducted to gain some insight into the oxidation characteristics of a series of columbium-zirconium and columbium-zirconium-titanium alloys oxidized between 800° and 1200°C. The alloys investigated were found to undergo simultaneous external and internal oxidation. The internal oxidation was manifested as a lamellar dispersion of monoclinic ZrO_2 in a columbium-rich beta solid solution matrix. The coarseness and quantity of the dispersion were found to vary in many of the alloys across the internally oxidized region. A correlation was obtained between the variation in the quantity of the dispersed ZrO_2 and the exponent "n" of the following general oxidation equation:

$$W = kt^n,$$

where W is the weight gained per unit area at time t , and k is a constant. The minimum value of the exponent obtained was 0.23 and it occurred on a 40 a/o columbium, 50 a/o zirconium, 10 a/o titanium alloy oxidized at 1000°C. The best alloys studied from the standpoint of oxidation

resistance were about 20 times as resistant as pure columbium after 100 hours at 1000°C. The lower than 0.5 value of the oxidation exponent "n" found for many of the alloys means that the rate of oxidation weight gain decreases faster than for a "parabolically" controlled alloy.

The variation in exponent "n" with temperature was found to go through a minimum near 900°C for a 50 a/o zirconium, 45 a/o columbium, 5 a/o titanium alloy. The binary columbium-zirconium alloys studied were found to undergo a rapid increase in weight gain after several hours at temperature (breakaway). The time to breakaway was found to be a minimum at about 900°C. The addition of titanium to columbium-zirconium alloys was found to suppress the breakaway phenomenon.

An x-ray diffraction study of the oxidation products present on many of the alloys was made and a ternary, 1000°C isothermal section of the Cb-Zr-O phase system was constructed. A lack of spalling was observed in many of the alloys on thermal cycling and this was attributed to a "rooting" effect due to the continuity of the lamellar ZrO₂ dispersion between the external oxides and the internally oxidized region of the alloys.

An oxidation mechanism was proposed for columbium-zirconium alloys based on the mode of nucleation of alpha zirconium from oxygen saturated beta solid solution.

Microfilm \$2.55; Xerox \$8.80. 194 pages.

DETECTION OF EQUILIBRIUM VACANCY CONCENTRATIONS IN ALUMINUM

(L. C. Card No. Mic 60-448)

Soji Nenno, Ph.D.

Northwestern University, 1959

The objective of this work is to detect and measure equilibrium vacancy concentrations and to estimate the energy of formation of a vacancy in aluminum. For cubic isotropic crystals, if l is the length of a sample and a the lattice parameter at a temperature T while l_0 and a_0 are corresponding values at a standard temperature T_0 , the fractional concentration of vacancies, c_v , present at temperature T is expressed as

$$c_v = 3 \frac{(l/l_0) - (a/a_0)}{(l/l_0)}$$

provided that T_0 is a low enough temperature that $c_v(T_0)$ is negligible. Therefore, the vacancy concentration is obtained from the difference between these two experimentally measured quantities. The lattice parameter of aluminum was measured at intervals from room temperature up to 5°C below the melting point, and was compared to the bulk thermal expansion. Bulk thermal expansion measurement can be made with greater accuracy than by the X-ray determination of lattice parameter, and three independent investigators have made bulk thermal expansion measurements on pure aluminum. The results of the measurements by Taylor et al., and of Feder and Nowick on 99.996%, and 99.997% pure aluminum, respectively show a fair agreement with each other in the range between 400°C and the melting point and are in very good agreement with those of Nix and MacNair who measured up to 400°C on 99.997% pure aluminum. In the present work only the X-ray measurements were made.

Aluminum rods were obtained from Johnson, Matthey with a specified purity of 99.996%. The samples were thin rods annealed and sealed in a quartz capillary under a 2×10^{-7} mmHg. vacuum. Cobalt K radiation was used with a Unicam 19 cm diameter powder camera, which was operated under a vacuum of 10^{-5} mmHg. Around the quartz capillary a length of platinum wire was wound which was used as a thermometer. Diffraction patterns of the aluminum sample and platinum were obtained simultaneously at given temperatures. The expansion of the platinum standard was used to determine the temperature. In this way specimen temperature was determined to within 1.5°C. Probable error in lattice parameter measurement of aluminum was 5×10^{-5} .

The result of lattice thermal expansion measurements on the aluminum is expressed as an empirical equation:

$$a_t/a_0 = 1 + 2.2724t \times 10^{-5} + 8.188t^2 \times 10^{-9} + 2.02t^3 \times 10^{-12},$$

where a_t and a_0 are lattice parameters at t° and 0° C respectively; the maximum deviation being 8×10^{-5} . The results of bulk and lattice thermal expansion measurements are in good agreement up to about 400°C, while they are in fair agreement at higher temperatures. The difference between them at higher temperature, which is proportional to the concentration of vacancies, increases exponentially with temperature. The corresponding vacancy concentration at the melting point, $c_v(\text{m.p.})$, is $(1.3 \pm 0.1) \times 10^{-3}$, the exponential increase gives a formation energy of $(0.61 \pm 0.05)\text{eV}$, if the bulk thermal expansion data by Taylor et al. are used. If Feder and Nowick's data of the bulk thermal expansion are used, the corresponding quantities are: $c_v(\text{m.p.})$ is $(1.0 \pm 0.1) \times 10^{-3}$ and h_v $(0.67 \pm 0.07)\text{eV}$. The two sets of these values obtained from two independent data of the bulk thermal expansion are not greatly different. Upon averaging them we have: $c_v(\text{m.p.}) = (1.1 \pm 0.2) \times 10^{-3}$, $h_v = (0.64 \pm 0.10)\text{eV}$.

The results obtained are in fairly good agreement with the corresponding values obtained from the quenching experiments on pure aluminum by Bradshaw and Pearson, and DeSorbo and Turnbull whose results are: $c_v(\text{m.p.}) = 6 \times 10^{-4}$ (B. and P.), $h_v = 0.76 \pm 0.04\text{eV}$ (B. and P.), $h_v = 0.79 \pm 0.04\text{eV}$ (D. and T.). However, the quenching may not have frozen in all the vacancies present in equilibrium, hence we may expect a smaller value of c_v in the quenching experiments than ours.

Therefore, it is concluded that the concentration of vacancies at the melting point and the energy of formation of a vacancy in aluminum (99.99%) are $(1.1 \pm 0.2) \times 10^{-3}$ and $(0.64 \pm 0.10)\text{eV}$, respectively.

Microfilm \$2.50; Xerox \$3.60. 63 pages.

THE INFLUENCE OF SOME TRACE ELEMENTS ON THE GRAPHITIZATION KINETICS OF CAST IRONS

(L. C. Card No. Mic 59-6860)

George Sandoz, Ph.D.

University of Maryland, 1959

Supervisors: Professor William A. Pennington
Dr. B. F. Brown

There are intimations and even outright warnings scattered through the literature on the malleabilization of white

cast irons to the effect that the presence of trace amounts of some elements - elements deriving adventitiously from the scrap as solders, bearing materials, etc. - may interfere with graphitization kinetics to an extent that may render the irons unfit for the malleabilizing anneal. However, no really quantitative study to evaluate such claims has appeared, and accordingly the present investigation was undertaken.

Specifically, it was undertaken to determine quantitatively the effects of trace amounts of the elements bismuth, antimony, tin, lead, cadmium and zinc on the kinetics of the three graphitization reactions critical to the malleabilization of irons, and to identify the mechanisms involved. A parallel study on the effects of manganese and sulfur on the three reactions was conducted for the purpose of establishing the mechanisms controlling graphitization kinetics in unalloyed irons. This information was used as a base of reference for identifying the mechanisms involved in the effects of the trace elements, particularly with respect to indirect effects caused by interactions with sulfur. A supplementary study of the influences of graphite nodule number (nucleation rate) on the three graphitization reactions was also carried out and normalization data were evolved to permit the intrinsic effects (effects not associated with nodule number) of alloying elements to be compared. This was done because only by unmasking and

evaluating the intrinsic effects of the trace elements could it be hoped to rationalize their observed effects within the framework of known physical and chemical principles.

The results demonstrated that manganese and sulfur, insofar as they are not combined as the sulfide, restrict first stage graphitization and probably the indirect second stage graphitization of pearlite by dissolving in and stabilizing the cementite phase relative to the graphite phase. A mechanism associated with the relative ferrite and pearlite "hardenabilities" was proposed to explain the effects of manganese and sulfur on the direct second stage graphitization of austenite.

The effects of the trace elements were found generally to be less severe than is popularly believed. A large part of the retarding effects that were observed could be attributed to lower nucleation rates. The effects of the trace elements were found to vary, or even to be reversed, depending on the amount of sulfur in the iron not combined as manganese sulfide. The data were rationalized in terms of thermodynamic estimates of the relative potentials of the trace elements to combine with sulfur in competition with iron and manganese. Where interactions with sulfur did not occur, the retarding effects of the trace elements were related to mechanisms analogous to those involving manganese.

Microfilm \$2.55; Xerox \$8.80. 194 pages.

FINE ARTS

A REPORT OF RESEARCH ON THE DEVELOPMENT OF A SERIES OF OIL PAINTINGS

(L. C. Card No. Mic 59-6222)

Margaret Ellen Kirkpatrick, Ed.D.
New York University, 1959

The Problem

This study dealt with personal research in a creative project. It had as its basic problem the discovery and invention of shapes, relating them to art elements within the space of paintings.

Need For the Study

It is important that art teachers know the creative process through continuing personal experience in areas of their own choice. Theirs is the responsibility for demonstrating a type of teaching which develops artistically conscious and creative individuals who contribute to the building of a society that values the inventiveness of the creative mind used for constructive purposes and acknowledges the worth of aesthetic achievements.

Procedure

Research activity from November 1957 to August 1958 produced twenty-seven oil paintings. Caution was used to

maintain a normal painting schedule. This was felt to be a requirement of the study. Progress in the research was recorded by: (1) the paintings themselves, numbered, timed, and dated (2) written comments in journal form regarding technical decisions, noteworthy ideas or experiences, and (3) photographs of work in process and completed.

Findings

The process of creating a painting was found to be a complex of inter-related acts consciously or intuitively experienced. Shapes, as patterns of forces realized kinesthetically, contributed to the totality of the design, never exclusively dominating it. A final satisfactory solution required attention to all elements. Little predictability as to outcome was apparent early in the process. No arbitrary sequence of acts was revealed. Important sources influencing the inception of paintings were weather and the forces of nature, exhibitions and the performances of creative works, and technical interests arising within the paintings. These interests concerned chiefly the passage of light and dark, methods of showing color against color, and contrasts in textures. When problems were met and studied, insight into solutions resulted; however, time spent was variable. Thematic associations evolved as work progressed. Environment contributed to ease and clarity of expression. Daily happenings, imaginings, and recall of past experiences influenced the research.

Freedom from imposed pressures and anxieties was found to assist the creative process; mental fatigue and emotional strain noticeably blocked progress.

Implications for Art Education

The findings of this study affirm that the creative process is an intellectually stimulating one contributing to the total integration of the person. The creator searches, finds, studies, selects, rejects, and organizes in order to express himself sincerely and artistically. Art, as such an experience, should be given a more favored position in education through improved facilities, schedules, budgets, and teaching methods. Approaches to art teaching that are prescribed, mechanistic, teacher-imposed, group-oriented, focused either upon fragmented learnings or upon innovations for the sake of novelty, may deter rather than assist the creative process. It is the use of sense impressions and the harmonizing of tangible matter with intangible ideas that produces ingredients for creative power and aesthetic worth. This experience of creating can be best obtained in an atmosphere conducive not hostile to art, congenial to the worker, with pressures and distractions at a minimum. Opportunities for personal expression and discoveries at individual growth rates are essential. Teaching procedures should be given close scrutiny not only to safeguard a non-competitive, unhurried learning situation, but also, through improved motivation and guidance, to provide richer nourishment to student powers. Art teaching should be the responsibility of one acquainted with the creative process through personal involvement. More careful selection and training of teachers is suggested. It is essential for them as students to know valid teaching methods through personal participation. Experiences harmonious to the development of their highest potential as artist-teachers are due them.

Microfilm \$2.50; Xerox \$8.20. 180 pages.

THE EARLY LIFE OF JOHN NEAGLE, PHILADELPHIA PORTRAIT PAINTER.

(L. C. Card No. Mic 59-5210)

Ransom R. Patrick, Ph.D.
Princeton University, 1959

The purpose of this thesis is to reconstruct, in as much detail as possible, the early life of the portrait painter John Neagle. This self-taught, native born American painter was born in Boston in 1799, and died in 1865 in Philadelphia, where he had lived most of his life. (Evidence is given to show that 1799 is the most tenable date of Neagle's birth.)

The basic contention of the thesis is that Neagle has been greatly underestimated as an artist. All of the biographical material pertinent to Neagle's life and art which was available to the author is included. The above stated contention is one of the principal factors determining the selection of illustrations for the thesis. Beyond this, the illustrations are used in support of evidence presented in establishing two other main points: (1) Neagle's style in terms of influence from at home and abroad, and, (2) his aesthetic point of view relative to the creation of his own work, his criticism of the work of others, and his artistic relationships.

The general conclusion of the thesis is that John Neagle was influenced by the English point of view, but that his strong tendency toward objectivity, which is said to be characteristic of native Americans, inclined to give him a healthy balance between the two styles. Finally, the author contends that Neagle was one of the most significant portrait painters in nineteenth-century American art, and that his work is worthy of more emphasis than it has, at times, been given.

Microfilm \$2.90; Xerox \$10.15. 222 pages.

FOOD TECHNOLOGY

ENVIRONMENTAL FACTORS AFFECTING THE QUALITY OF FROZEN MEAT

(L. C. Card No. Mic 59-6379)

James Leonard McBee, Jr., Ph.D.
University of Missouri, 1959

Supervisor: H. D. Naumann

The high quality potentials of frozen meats are not always realized due to variations in the original quality and to the subsequent processing and storage environments. The development of correct selection, processing, and handling methods would be aided by the determination of organoleptic and chemical changes which take place under conditions as might be experienced by a frozen product.

The effects of length of storage, storage temperature, type of product, and aging period on organoleptic and

chemical changes of frozen ground meat form the basis of evaluation for the first phase of this study.

Ground meat from three types of product which had been aged for three periods of time was frozen, stored under five temperature treatments, and tested by organoleptic and chemical methods at three month intervals up to twelve months storage.

The results showed that length of storage, storage temperature, and type of product had significant effects on the organoleptic evaluations and chemical constituents of frozen meat. The analyses for coagulable nitrogen and amino nitrogen indicated the degree of proteolysis and denaturation which occurred in the lean tissue. Although there were significant changes in these constituents which followed a consistent pattern, the changes were of such a small magnitude that it would be impossible to use them to ascertain the acceptability or predict the distribution life of frozen meats. The results of these analyses as

well as the organoleptic data indicated little change in flavor due to protein deterioration. The 2-thiobarbituric acid values support the observations from the organoleptic evaluations that changes in the fat are mainly responsible for the decrease in palatability of frozen meat.

The correlation coefficients between the various sensory panel evaluations were highly significant, which points out the possibility of using odor and flavor interchangeably in the evaluation of rancidity and desirability. The relationship between 2-thiobarbituric acid values and the taste panel evaluations for rancidity and desirability was very significant.

It is recognized that freezing does not usually improve the quality of meat. A possible exception is the increased tenderness attributed to freezing by some workers. This freezing effect is important from the standpoint of meat tenderness research and as a potential method of making meat more tender.

The objectives of the second phase of this study were (1) to determine the effects of freezing, temperature of freezing, and grade on beef tenderness as measured by organoleptic and mechanical methods; (2) to evaluate a method of measuring tenderness by pressure; and (3) to establish the relationships between tenderness evaluation methods.

Steaks from forty-eight short loins of two grades were evaluated fresh and after freezing at three temperatures. Steaks from 160 short loins aged ten days at 36°F. and representing six grade categories were also used. The methods of evaluation included taste panel, Warner-Bratzler shear, tenderness press, and micro-tenderness press.

The results indicated that freezing did not increase tenderness, but in some cases had a slightly adverse effect. Temperature of freezing did not measurably affect tenderness. Grade had a significant effect on tenderness, with a general trend toward lowered tenderness with lowered grade. However, there was considerable overlapping of tenderness evaluations among the grade categories.

The Warner-Bratzler shear (cooked) was the most accurate mechanical method used in these experiments for measuring tenderness. Tenderness press (cooked) evaluations were significantly correlated (at the .01 level) with organoleptic scores and the Warner-Bratzler shear (cooked), but was not as accurate a measure as the Warner-Bratzler shear. The Warner-Bratzler shear (raw), tenderness press (raw), micro-tenderness press (cooked), and micro-tenderness press (raw) were of less utility for measuring tenderness.

Microfilm \$2.70; Xerox \$9.45. 207 pages.

THE EFFECT OF VARIOUS ENVIRONMENTAL CONDITIONS DURING AGING ON SHRINKAGE AND ORGANOLEPTIC CHARACTERISTICS OF BEEF AND THE EFFICACY OF OXYTETRACYCLINE FOR AGING BEEF

(L. C. Card No. Mic 59-6385)

Rhule Bailey Sleeth, Ph.D.
University of Missouri, 1959

Supervisor: H. D. Naumann

Since the consumer demands tenderness as well as other palatability factors in meat, improvement in the

quality of beef through aging is a long-established practice in the meat industry. However, the problem of aging and tenderizing meat properly and economically with the least possible amount of wastage due to shrinkage and cutting loss is of paramount importance to the meat packer.

The effect of various temperature, humidity, air flow, and ultraviolet radiation conditions was studied on paired beef quarters and wholesale cuts of different weights and grades. Determinations were made of shrinkage, microbial growth, thawing (drip) and cooking losses. Organoleptic responses reflecting the differential effects of the various aging treatments and freezer storage were studied. Graphs are presented showing shrinkage and organoleptic characteristics of beef aged under controlled environmental conditions.

On the basis of the results, the following findings appear most significant: Grade, length of the aging period, and relative humidity of the aging room affect shrinkage. Tenderness, flavor, aroma, and juiciness values for beef quarters and ribs aged two to three days at elevated temperatures were comparable to those aged twelve to fourteen days at 2.2° (36°) and 4.4°C. (40° F.).

Aroma, flavor, and tenderness increased during freezer storage. Juiciness, and total thawing (drip) and cooking losses were approximately equal for the treated and control steaks.

Beef aged more than one day under ultraviolet radiation at elevated temperatures in excess of 26.7°C. (80°F.) had a tendency to develop microbial growth on the surface along with deep spoilage. The utility of oxytetracycline to control this spoilage was investigated.

U. S. Utility grade cattle were injected intramuscularly with oxytetracycline at the rate of 0.60 and 0.80 milligram per pound of body weight thirty minutes to six hours ante-mortem. At the time of slaughter, samples of blood, heart, liver, kidney, spleen and muscle were taken from each animal for bioassay. The concentration of oxytetracycline in these tissues was affected by time lapse between injection and slaughter. The concentration in the blood decreased with time while the concentration in other tissues, except spleen, increased but had not plateaued at the end of six hours. No oxytetracycline was found in the spleen.

Total surface bacteria, coliform, yeast, and mold counts were negligible after the carcasses were washed and sprayed with oxytetracycline and nystatin or sorbic acid prior to aging. Counts increased during aging until processed but were not extensive enough to cause sliming and spoilage. A combination of twenty parts per million oxytetracycline and twenty parts per million of nystatin was more effective in reducing total surface microflora than a similar combination of oxytetracycline and sorbic acid. Total bacteriological counts of the synovial fluid, popliteal lymph node, and the semimembranosus muscle increased slightly during aging. However, this increase was not significant.

When oxytetracycline was injected thirty minutes to six hours prior to slaughter, protection of beef during high temperature aging did not appear to be a function of time oxytetracycline was injected ante-mortem. Adequate protection was provided when animals were injected only thirty minutes prior to slaughter.

Aging temperatures did not influence the dissipation rate of the antibiotic in muscle tissue.

When compared to raw steaks, there was a substantial

reduction in oxytetracycline concentration of medium rare steaks with no detectable residual found in the medium well done steaks.

Raw and cooked meat containing low levels of oxytetra-

cycline, when fed over a period of five weeks, did not cause any detectable residual in blood serum, heart, kidney, or muscle of rats.

Microfilm \$3.75; Xerox \$13.30. 291 pages.

GEOGRAPHY

A SURVEY OF POSTWAR RAILWAY DEVELOPMENTS IN THE SOVIET UNION (1946-1958)

(L. C. Card No. Mic 60-380)

Michael Biloz, D.S.S.
Syracuse University, 1959

Supervisor: George B. Cressey

The Soviet railroad system has frequently been called the "Achilles' heel" of the Soviet economy because of its apparent neglect during the drive for rapid industrial expansion outlined in the Five-Year Plans. With the increased tempo of industrialization scheduled after World War II, it was necessary to direct more attention to the transportation sector if the needs of the economy were to be met.

This study traces the development of the railroad system during the period of the three postwar Five-Year Plans taking into account the specific provisions made in each plan for railway expansion. The extent and areal distribution of this expansion are analyzed and evaluated in light of the professed objectives of the individual plans.

A major part of the essay is devoted to an exposition of new railroad lines scheduled for construction during each five-year period. The degree of success achieved in completing these projects is a significant consideration of the study. Electrification and double-tracking of existing lines are also evaluated in terms of the plans' objectives and their effect upon the operation of the railroad network.

Major problems arising during the course of each plan are analyzed, along with the various proposals offered for their solution, to determine the relative strengths and weaknesses of the existing network. Attention is also directed to future projects designed to meet the needs of the expanding economy.

The chronological arrangement of the topic, with its focus upon the elements of time and space, lends itself to both the historical and geographical methods. The study is organized within the framework of the postwar Five-Year Plans and outlines the development of the network under each plan according to data published in the Soviet press, journals, books, atlases, and maps. Cartographic aids are employed throughout the text to illustrate the different stages of postwar railway expansion.

The results of this study indicate that railway expansion in the postwar period took place predominantly in the eastern regions of the country after the successful rehabilitation and reconstruction of the war-damaged network. The Urals, Western Siberia, and Kazakhstan were the regions marked by the most extensive construction of new

lines. A total of 6,750 miles of new railroad were constructed during the three plans, bringing the total route-miles of line in operation to 77,312 miles.

Electrification and double-tracking of existing lines took place primarily on the main lines of the network which also received priority for technical improvement of permanent way and modernization of rolling stock. The increased carrying capacity of these lines enabled the railroads to overfulfill the plan for freight turnover in each five-year period.

This achievement is rather remarkable in view of the general shortcomings of the plan and indicates the disproportion between the increase in the volume of freight carried and the expansion of the network. The consistent failure of the railroad plans to achieve their other targets reflects the government's policy of maximizing railroad services with a minimal outlay of resources.

The railroads appear to be operating at full capacity, and efforts are being made to shift part of the traffic burden to other means of transportation. All this reflects the Soviet Union's desire to achieve better balance in its transportation system which has relied too heavily in the past on the successful operation of its railroad network.

Microfilm \$2.85; Xerox \$9.90. 219 pages.

THE PHYSIOGRAPHIC PROVINCES AND CYCLIC EROSION SURFACES OF SWAZILAND

(L. C. Card No. Mic 60-426)

Harm Jan de Blij, Ph.D.
Northwestern University, 1959

Adviser: W. E. Powers

A study in Physical Geography, the volume considers the empirical physiography and the genetic geomorphology of Swaziland, a British protectorate in southeast Africa. The work is divided into three parts. In Part I, the theoretical foundations for the field work are discussed. The division of the protectorate into areas possessing a certain degree of internal homogeneity, physiographic provinces, is based on several criteria. These criteria are geology, climate, geomorphology, relief and slope, soils, and vegetation. The conceptual framework for geomorphology is discussed with special reference to the Davisian views on peneplanation, Penck's challenging pediplanation, and King's revolutionary concepts of cymatogeny and the uniformitarian nature of hillslopes.

Part II is largely factual. The area is considered in terms of each of the criteria enumerated in Part I, and evidence of importance to physiography and geomorphology is presented with the aid of maps and diagrams. Swaziland lies on the eastern plateau slopes of the subcontinent, with the greatest heights occurring in the west. The geology consists of the ancient Swaziland System, made up of heavily folded metamorphics, the granites, which have been divided into five categories, and the Karroo representatives, comprising both sedimentary and extrusive sequences. The climate of Swaziland is found to be more moist than generally supposed, and the rainfall ranges from 22 inches in the low east to 74 inches in the high west. The vegetation of the area varies from the grasslands of the higher west to the eastern savannah. Soils are complex, especially in the east.

Part III applies to the concepts to the area. First, four major physiographic provinces are established, which form north-south belts. These are the High Veld Province in the west, the Middle Veld Province in the central section of the protectorate, the Low Veld Province which is largest in total area and lies in the east between the Middle Veld Province and the Lebombo Province. The latter is the Lebombo Range, a prominent north-south ridge at the east. Boundaries between these provinces are established on the basis of the criteria enumerated in Part I and the details assembled in Part II.

Each physiographic province is subdivided into sections or subprovinces to a total of 30. The major provinces and their subdivisions are represented on a map to a scale of 1/350,000. The characteristics and boundaries of each major province are first discussed. Subsequently, every section is described in detail and its establishment is justified. The High Veld Province is marked by great heights and grass cover, with deep dissection. The Middle Veld Province is undulating, and the Low Veld Province is relatively homogeneous in its flatness and savannah vegetation.

The chapter on the geomorphology of the area is accompanied by a map of the cyclic erosion surfaces. Three surfaces have been recognised: the Early Tertiary surface which by King has been termed the "African," and which occurs in the higher regions at elevations of 5,000 feet, the Late Tertiary or Victoria Falls surface, and the multi-phase Quaternary surface which lies in the low regions. The Quaternary surface includes an Early Level at highest elevations, a Middle Level at intermediate elevations and a Late Level in the lowlands. The initial stages of a fourth level are evident.

Microfilm \$3.90; Xerox \$13.75. 302 pages.

THE DEVELOPMENT OF THE WATER POWER OF THE WISCONSIN RIVER

(L. C. Card No. Mic 60-429)

Herbert Lawrence Gaede, Ph.D.
Northwestern University, 1959

In 1907 the private, cooperative development of the water power of the Wisconsin River was initiated. Fifty years later the work was virtually complete and an analysis of the background, nature, and results was possible.

The river development was conceived and carried out as a slowly evolving, essentially single purpose scheme. Its intents and obligations were vague, poorly defined, or non-existent outside of the major objectives involving water power development.

The growth of the system took place in a historic, cultural, and physical setting which was unique and, in most respects, unusually favorably disposed to aid the development. Serious river use problems were few and the major objectives of the river development were achieved to a high degree. In modifying the river, little else was changed in the region. This lack of impact on the region resulted from the limited scope of the plan, the slow rate of development, the specific intent of the plan, and the low level of utilization of the lands surrounding the river.

The lack of disruption of existing activities was most desirable but the loss of several opportunities for regional improvement represents a major shortcoming of the system. Poor coordination with government units, particularly with reference to the maladjustment of tax assessment values; the lack of land use planning; and the failure to realize opportunities for recreational development are among the deficiencies of the development method.

It is doubtful if a total situation resembling that under which the development of the water power of the Wisconsin River took place is likely to be duplicated in other regions. However, it is likely that principles learned from this river development effort can be useful in other situations. Particularly important are deficiencies which have resulted from the limited nature of the plan, its lack of coordination with other authorities, and the lack of development of authority to continue work started by private interests. Probably the greatest virtues of the Wisconsin Plan of river development are the lack of public financial obligations for a project designed to benefit a limited segment of the economy, and the "by-product" benefits of river regulation which accrued to the region as a result of the private development of the power resource.

Microfilm \$4.10; Xerox \$14.40. 318 pages.

A STUDY OF THE GEOGRAPHY COURSE OFFERINGS IN A SELECTED NUMBER OF AMERICAN COLLEGES AND UNIVERSITIES FOR THE COLLEGE YEAR, 1949-50

(L. C. Card No. Mic 60-660)

Arthur Melvin Grove, Ed.D.
University of Kentucky, 1952

It can be said that in a general way geography is developing with approximately the same degree of attention throughout the United States. When the course offerings are considered within their three major classifications (systematic, regional, technique) little variation was found among the course offerings on a regional basis. Variations are apparent in the distribution of the courses within these classifications. The East shows a definite interest in courses in resource use; the Far West in courses in physical and human geography. There exists a regional consciousness in the three areas--the Pacific Northwest, the South, and New England. Canada is studied with but one exception by states bordering on the Great Lakes. The East is interested more in Europe than is the Far West. The reverse is shown in the interest expressed in Asia.

Geography is composed of approximately 70% systematic geography. The most significant offering in the systematic courses are in the area of resource use geography. The offerings here constitute 27.76% of all course work when compared on the basis of student enrollment in geography courses. Survey courses in geography are next in importance with 19.84% of the total offerings; physical geography includes 8.60%; human geography, 7.93%; political geography, 2.61%; weather and climate courses, 2.43%; courses fashioned around geographical literature, 0.18%; and the two courses offered in mathematical geography trail with 0.01% of the offerings.

The systematic courses when studied in a regional delimitation show considerable variation as to offerings. The Midwest leads in survey geography; the East, in resource use geography; the Far West in both physical geography and in courses in weather and climate; the South leads in the offerings of political geography.

Work in regional geography demands 27% of the student enrollment. Twenty-eight different classifications were used. Ten were needed for the courses offered in the geography of the western hemisphere and 17 were needed for similar courses in the eastern hemisphere. The twenty-eighth classification was used for the general courses in world geography.

The courses in the western hemisphere geography tended to divide themselves easily into the classification framework devised. Some combining of courses is evident between the two countries of the United States and Canada. Some confusion exists in the offerings of Latin America geography. Attempts are being made to offer courses in some of the geographic regions of Latin America. Much confusion also exists as to the best way to study the eastern hemisphere. Though Europe, Africa, Asia, and Australia are all studied in some institutions as units they are also combined in many. Perhaps the most significant part of the study is the knowledge that results in the fact that of the approximately 2,400,000 college and university students in the United States only 60,000 find their way into a course in regional geography.

Four divisions are used in classifying technique courses--cartography, field work, geography in education, and seminar and research. The Midwest has the largest enrollment in technique courses.

Microfilm \$2.75; Xerox \$9.70. 211 pages.

REGIONAL ENERGY POTENTIALS OF CONVENTIONAL NONRENEWABLE ENERGY SOURCES IN THE SOVIET UNION

(L. C. Card No. Mic 60-381)

Jordan Atwood Hodgkins, Ph.D.
Syracuse University, 1959

Supervisor: George B. Cressey

Energy in some form, from the most primitive societies through the most complex, is the physical effort behind all productive activity. Moreover, its development is the key to a nation's technical and industrial capacity and the resultant well being of her peoples. Established and potential energy resources are a yardstick generalizing the

level of the productive capacity of a nation and the possible magnitude of its various regions. Geography as the science of spatial relationships provides the student with the necessary framework by which regional developments and possible regional magnitudes may be studied.

The purpose of this study is to determine the regional pattern of the potential and established energy resource base of conventional nonrenewable energy sources of the U.S.S.R. These sources include: coal and brown coal, oil shale, oil and natural gas. To fulfill this objective, all fuel sources had to be expressed by a single unit of energy measurement. This was accomplished by converting all energy reserves to their kilowatt hour content. Procedures undertaken to achieve the study objective were:

1. Determine the reserve base for each energy resource.
2. Convert all reserve data on energy sources to their kilowatt hour content. To achieve this phase of the objective, it was necessary to determine first the thermal value for each energy reserve. The following kilocalorie values per kilogram were utilized: hard coal, 7,000; brown coal, 2,500; oil shale, 1,900; oil, 10,000, and natural gas, 8,800. The conversion factor of $\times .0011628$ was used to compute the kilowatt hour energy potential.
3. Determine the established production base.
4. Compare the potential energy resource base with the established production base to determine the status of regional use, and to locate potential power regions.

After conversions were completed the kilowatt hour energy potential for each energy resource was plotted on a separate map of the Soviet Union. When all maps had been compiled they were superimposed upon each other and the resultant montage data itself were permitted to suggest regions of varying intensity in energy potential. The montage map was then compared with the individual maps on energy production and conclusions formulated.

Data presented in this study warrant the following general conclusions:

1. When all conventional nonrenewable energy resources are measured in terms of a single energy criterion, kilowatt hours, coal accounts for 99.29 per cent of the total energy potential; oil shale 0.26 per cent; oil, 0.23 per cent; and natural gas, 0.32 per cent.
2. Regional patterns for these resources evolved suggested by the data itself.
3. The supremacy of coal in the U.S.S.R. corresponds to coal's predominance in the energy framework of the United States and the World.

The following specific conclusions are also substantiated by the data present:

1. The vast preponderance of Soviet energy potential lies east of the Urals and is represented by a single energy resource - coal.
2. Energy potentials and reserves of oil, natural gas and oil shale are located primarily in European Russia, including the Urals and Caucasus.
3. The production and consumption of all types of conventional nonrenewable energy resources is centered in the European sector, including the Urals and Caucasus.

4. Consumption of all types of energy resources in the European sector takes place for the most part in the South, including the Ukraine and Moldavia, the Central Regions and the Urals.

5. In order to satisfy the needs of European consumers in the Volga, Ural and Central Regions, large quantities of coal are imported from basins east of the Urals.

6. In order to minimize the importation of coal from remote basins, the so-called local fuels, such as oil shale, brown coal and peat, are utilized to the fullest extent in the European Basin.

7. According to Soviet data, coal mining costs are reportedly less expensive in the several basins east of the Urals. This factor may have influenced Soviet planners in their decision to emphasize certain phases of economic development in the eastern regions over the next decade.

Microfilm \$5.10; Xerox \$18.00. 398 pages.

URBAN PLACES AND PASSENGER TRANSPORTATION IN URUGUAY

(L. C. Card No. Mic 60-455)

David Elmer Snyder, Ph.D.
Northwestern University, 1959

Adviser: Clarence F. Jones

The research represented by this dissertation constitutes a study of urbanism and urban places in Uruguay. It is a study directed toward the formal analysis of empirical patterns of urban places through the application of the regional concept. The relatively small size of the study area, the Republic of Uruguay, provides a laboratory of manageable areal extent for a geographic study of urban place relationships. The unchallenged supremacy of Montevideo, the capital city, as the primary urban center and core of a great metropolitan development provides an excellent opportunity for analytical description of the role of the primate city in organizing and influencing the growth of lower order urban places.

In this study the analysis has emphasized elaboration upon three essential and interrelated considerations relevant to central place theory: 1) population size and functional properties of urban places, 2) the geometric spacing patterns of urban places, and 3) the linkages or organizational ties among urban centers and those between urban centers and surrounding rural areas. These latter investigations have been approached through the application of commercial passenger transportation services as a test variable from which measures of urban place linkages and areas of influence could be secured. Chapters II, III, and IV are oriented specifically toward a discussion of the first two aspects; Chapters V and VI deal with the third aspect.

Whereas an explicit statement of a logically consistent body of principles relating to central place theory has never been formulated by urban geographers, any analysis of the empirical patterns of urban places in Uruguay is not strictly comparable with work done previously in other areas and other cultural settings. In general, however, the findings of this dissertation reveal that the patterns of urban place development in Uruguay are in conformity with

the various notions of an urban place hierarchy as suggested by urban geographers.

Microfilm \$4.00; Xerox \$13.95. 310 pages.

A GEOGRAPHY OF FOOD SUPPLY IN CENTRAL MINAS GERAIS

(L. C. Card No. Mic 58-7245)

Kempton Evans Webb, Ph.D.
Syracuse University, 1958

Supervisor: Preston E. James

This study is concerned with the problem of supplying Brazil's rapidly growing cities with sufficient quantities of food. Specifically, the objectives of this study are to show (1) from where, and (2) by what means the key city of central Minas Gerais, Belo Horizonte, is supplied with basic food commodities, and (3) to place the food supply phenomenon in the larger context of its physical bases, its historical development, and its relationships with other factors relevant to its pattern and function.

A paucity of published sources and reliable official figures directly related to the problem made it necessary to rely heavily upon information gained through interviews with people connected with the different phases of food production, marketing, transportation, processing, etc. The information obtained by interviews, supplemented by personal observations made on numerous field trips, was plotted on maps showing the source centers of the most basic foods and their associated routes of movement to Belo Horizonte.

The food consumption of Brazil's rapidly growing cities, although differing in detail from that of rural areas, is essentially the same with respect to the staple items of diet: rice, beans, farinha (manioc meal), maize meal, sugar, lard, and limited amounts of beef. Such a consumption pattern reflects a relatively low income level. Commercial food production for all Brazil appears to be increasing at a rate at least equal to the population increase rate, yet the complications of speculative production, poor transportation, harvest fluctuations, and lack of food storage facilities cancel, in large measure, any overly optimistic view as to the adequacy of urban food supply.

Minas Gerais has both good and bad agricultural land. The state's best potential areas for food cultivation are associated principally with places originally covered by semideciduous forest and relatively fertile diabase, limestone, or Archean rock-derived soils. The percentages of cultivable land (under the Brazilians' definition and methods of cultivation), however, continues to decrease.

An investigation of the origins and development of a food economy in Minas Gerais reveals how the basic characteristics of the food supply process which evolved during the gold rush era of the eighteenth century have persisted into the twentieth century. Then, as now, many food commodities were transported to central Minas Gerais from far distant places. Then, as now, the same main deterrents to a more smoothly operating food supply system prevail: the obstacles of great distance and inadequate transportation facilities, low productivity, relative lack of competition, and speculation in food commodities.

Present day source centers of basic foods consumed in Belo Horizonte are generally located hundreds and even thousands of kilometers away from that city. Chief supplying areas are southeastern Goias; the Triangulo, the West, and the southeastern corner of Minas Gerais; Rio Grande do Sul; and northern Parana. Perishable foods (fruits, vegetables, and milk) come mostly from the immediate environs of the city. Trucks and trains are the principal carriers of food to Belo Horizonte, with by far the greater volume carried by trucks.

A recurrent theme which seems to characterize urban food supply in all but the most agriculturally diversified and productive areas of Brazil is the low degree of regularity and standardization of supply currents. The final conclusion is that the solution of urban food supply problems lies ultimately in the concerted effort directed against the fundamental causes of poverty and low productivity. Microfilm \$3.25; Xerox \$11.00. 250 pages.

GEOLOGY

INTRUSIONS AND ORE DEPOSITIONS IN THREE NEW MEXICO MINING DISTRICTS

(L. C. Card No. Mic 59-6996)

Charles Banks Belt, Jr., Ph.D.
Columbia University, 1959

In the early part of the twentieth century Niggli and others proposed that hydrothermal ore deposits are precipitated from solutions or fluids that had been separated from deep-seated magmas. This theory was based partly on the concept of the segregation of volatiles during the crystallization of an ore-bearing magma and partly on the evidence of a spatial relation between intrusion and ore deposition. The purpose of this paper is to test this concept, studying the primary petrology, hydrothermal alteration, and distribution of copper and zinc in silicic igneous plutons generally regarded as genetically related (in the Niggli sense) to nearby hydrothermal ore deposits. Silicic Tertiary plutons were chosen in three New Mexico mining districts, the Hanover-Fierro intrusive at Hanover and Fierro, the Granite Mountain pluton at Magdalena, and four outliers of the Lordsburg intrusive at Lordsburg. The detailed petrographic and alteration study of each sample taken was accompanied by an analysis for copper and zinc through a newly developed, sensitive, and accurate dithionite technique.

The plutons studied are complex intrusives, ranging in composition from tonalite or monzonite to calci-alkalic granite, and in texture from equigranular to porphyritic.

The exposed part of the Hanover-Fierro intrusion has a primary copper content of close to 51 ± 13 ppm and a primary zinc abundance of close to 43 ± 5 ppm. Primary copper is higher by a factor of two than the average for silicic igneous rocks but it is not considered abnormally high. The primary zinc abundance in the Hanover-Fierro intrusive agrees excellently with the average abundance of zinc in silicic igneous rocks.

The metal ion distribution in an igneous country rock in an area of few veins bearing metals may or may not be statistically related to primary igneous texture, composition and other features rather than to alteration. Where there are few veins, the average weight percent of alteration minerals is apt to be low and the amount of metal introduced into the country rock is apt to be small. Con-

versely, the metal ion distribution in an igneous country rock that is cut by numerous veins bearing metals is statistically strongly related to alteration rather than to primary igneous features. In such cases, the average weight percent alteration and the average amount of metal introduced is apt to be large. This same series of relations applies as well on a small scale, for as a single vein is approached from a distance in an igneous country rock, the intensity of alteration and metal content increases. Alteration and metal distribution are more closely related.

The most abundant metal in the veins and ore bodies of a mining district or a region of mineralization moves farther into the country rock than does a less abundant metal.

The results of this study raise the question whether the ore deposits of the three districts actually originated from the adjacent intrusives. It is suggested that further parallel studies elsewhere may afford a more fruitful approach to the problems of the genesis of hydrothermal ore deposits. Microfilm \$2.60; Xerox \$9.00. 197 pages.

A REGIONAL STUDY OF THE SILURIAN STRATIGRAPHY OF GASPE PENINSULA, QUEBEC.

(L. C. Card No. Mic 60-422)

Cornelius Franklin Burk, Jr., Ph.D.
Northwestern University, 1959

Supervisor: L. L. Sloss

A regional study of the various isolated belts of Silurian outcrop in Gaspé Peninsula demonstrates the presence of two elongate troughs, termed the Northern Gaspé Trough and the Southern Gaspé Volcanic Trough, which are divided by the St. John Arch. The chief sediment accumulated in these troughs is quartzose and calcareous silt. Around the trough margins and in association with volcanics, some thin zones of fossiliferous limestone are developed. A thin formation of pure, quartzose sandstone borders the northern side of the peninsula. The volcanic rocks, which occupy a belt in central Gaspé, are mainly submarine extrusions of andesite, commonly associated with fossiliferous limestone and interformational conglomerate.

Existing stratigraphic subdivisions of the Gaspé Silurian are slightly amended and six new units proposed. The St. Alban and Mont Joli Formations of eastern Gaspé, according to graptolite occurrences and the regional rock-stratigraphy, are Silurian in age and not Lower Devonian as previously described. It is therefore concluded that the time-stratigraphic range of the St. Alban and Mont Joli faunas extends down to at least the Wenlock (Middle Silurian), and that the areal and stratigraphic differentiation of supposed "Middle Silurian" and "Lower Devonian" shelly faunas in eastern Gaspé has been effected mainly by their environments and not by evolution. Graptolites, on the other hand, which can be directly correlated with the well-established Silurian zones of Britain, provide a firm basis for time-stratigraphic correlation.

During Silurian time, Gaspé Peninsula formed the northeastern terminus of a converging series of deeply subsiding troughs, bounded to the north and east by a stable shelf area. Southwest, along the strike of the Northern Appalachian orogenic belt, and to the southeast, across the belt, thicknesses, metamorphic grade and deformation increase. Gaspé's terminal position in this orogenic belt probably accounts for its unmetamorphosed character and the occurrence of some stable shelf lithologic associations. It is suggested that a direct structural connection between Gaspé and Newfoundland does not exist, and that the Gulf of St. Lawrence occupied a relatively stable platform during lower and middle Paleozoic time, separating the orogenic belts of these two areas.

Microfilm \$2.50; Xerox \$5.00. 100 pages.

GEOLOGY OF THE OHIO SHORE OF LAKE ERIE BETWEEN FAIRPORT AND THE PENNSYLVANIA BORDER

(L. C. Card No. Mic 60-726)

James Ellis Christopher, Ph.D.
The Ohio State University, 1959

The area investigated extends over a 50-mile long and 3- to 5-mile wide section of the Lake Plain, a physiographic subprovince between Lake Erie and the Appalachian Plateau. This Lake Plain represents a depositional surface constructed of 5 to 75 feet thick Cary and post-Cary lacustrine beds and glacial tills capping the surface of the Upper Devonian Chagrin shale.

Along the southeastern flank of the area rise the Late Cary Lake Escarpment end moraines. Into the northwestern side of these moraines the bluff of Lake Whittlesey has been cut to a maximum height of 60 feet. Farther to the northwest, between the bluff of Lake Erie and that of Lake Whittlesey, lies the shore of glacial Lake Warren. Blankets of glacio-lacustrine sand and gravel, 35 feet thick, cover the bedrock floor of eastern Lake and eastern Ashtabula counties.

The bluff of Lake Erie presents a northeast-southwest stratigraphic cross section of the Lake Plain. Here post-Cary lacustrine interbedded sand, silt and clay overlie Late Cary glacial tills. These tills, two in number, are generally separated from each other by lacustrine material, or by a boulder pavement or a zone of red clay and pockets of till. The tills consist of a pebbly to bouldery,

silty to sandy clay, as indicated by inspection, hydrometer and sieve analyses, and their Atterberg limits.

Concerning the response of the Lake Erie bluff constituents to degradational processes, sandy bluffs are largely undermined by basal or intrastratal contact springs, and attacked by wind deflation. Till bluffs lacking a permeable basal contact zone accessible to ground water possess low permeability, rise steeply, and fail by vertical shear. Failure by creep of a two-foot thick layer of the entire bluff occurs locally in bluffs with low sand, high silt, and moderate clay content. Freezing and thawing in conjunction with wave erosion are believed to actuate the process. Bluffs consisting largely of till resting on moist, lacustrine beds, 6 or more feet thick, tend to fail by slumping. Moisture is postulated to be seeping into the permeable zone from meteoric sources in central Lake County, and from the lake in western Ashtabula County.

Of the material supplied to the littoral drift by far the greater portion is contributed by bluff erosion. According to heavy mineral data, both the glacial tills of the bluff and beaches contain the same heavy minerals, except that the till suite contains a higher percentage of pyrite (40) than do typical beach deposits (5). The median size distribution of the beach sand decreases downdrift for a given stretch of beach, indicating that the littoral drift toward the northeast exercises a sorting action on sediment in transport similar to that of streams.

About one-half of the shore is protected by stabilized beaches. These the author has grouped into two categories: (1) the stream-mouth, or those controlled by the hydraulic effect of stream issuing into the lake, and (2) beach promontories, or those controlled by bedrock highs. Only the large breakwater-modified stream-mouth beaches of the major rivers contain enough sand to develop storm profiles of sand bars and troughs that come and go with changes in wind-vector and wave steepness. Beach promontories are associated with only a moderate sand supply. Most of the sand is concentrated on the exposed beach and in submerged spits that trail off downdrift from lakeward projecting apices of the beaches.

Microfilm \$3.80; Xerox \$13.50. 296 pages.

LATE CENOZOIC SEDIMENTATION AND TECTONIC DEVELOPMENT OF CENTRAL NEVADA

(L. C. Card No. Mic 59-5167)

Kenneth S. Deffeyes, Ph.D.
Princeton University, 1959

Study of four areas of outcrop of Cenozoic sedimentary rocks in central Nevada indicates a relatively continuous history of sedimentation, mostly in lacustrine environments during the Late Miocene and Pliocene epochs. In the central part of the Basin and Range province major normal faulting started during Late Miocene time and produced wide shallow basins which immediately began to accumulate sediment eroded from older Cenozoic volcanic rocks. The faulting, which has been relatively continuous since Late Miocene time, gradually increased the local topographic relief and produced coarser sediments. By the end of Early Pliocene time, Paleozoic rocks in the ranges were exposed to erosion.

During the deposition of clastic sediments occasional well sorted vitric rhyolite ash falls from distant volcanoes were added to the sequence and most of the ash was converted to zeolite minerals during diagenesis. A bibliographical review of similar occurrences of zeolite minerals indicates that alteration of this type is common in sedimentary environments. In the lowest part of the sequence all of the ash beds were altered to clinoptilolite, a high-silica variety of heulandite that is relatively close in composition to rhyolite. In the middle part of the sequence some of the volcanic glass remained unaltered as beds of vitric tuff, other layers were converted to clinoptilolite. In the upper beds the ash was altered partially or entirely to erionite, phillipsite, or clinoptilolite; possibly this progression of zeolite mineral types reflects the increasing salinity and alkalinity of the lake water in which the ash fell.

The erionite from Nevada was identified by optical and X-ray comparisons with the type specimen from Durkee, Oregon which was previously the only known occurrence of the mineral. The refractive indices and crystal system given in standard reference lists for erionite are in error and new determinations of the optical properties, density, and unit cell indicate that erionite is the only known fibrous zeolite mineral.

Quantitative estimates of the amount and rate of late Cenozoic deformation indicate that the rate of deformation is largely controlled by the rheological properties of the material beneath the more brittle crust. Breaking of the province into normal fault blocks has the net effect of thinning the crust, which reduces the difference between vertical and horizontal stress while maintaining regional isostatic equilibrium. In this process while the ranges are rising and the basins are sinking, it is to be expected that there will be local positive isostatic anomalies in the ranges and negative isostatic anomalies in the basins.

Microfilm \$2.50; Xerox \$6.20. 129 pages.

STRATIGRAPHY OF LOWER ORDOVICIAN STONEHENGE AND LARKE FORMATIONS IN CENTRAL PENNSYLVANIA

(L. C. Card No. Mic 59-6771)

Alan Chase Donaldson, Ph.D.
The Pennsylvania State University, 1959

The Early Canadian Stonehenge limestone near Bellefonte in central Pennsylvania, disappears along its belts of outcrop toward Williamsburg, 40 miles to the southwest. Reasons for its absence near Williamsburg can be sought among the following possible causes: an unconformity, signifying lack of deposition during Stonehenge time or erosion of the limestone after it was deposited; lateral change into a dolomite facies; a combination of non-deposition, erosion, and facies changes. This study is designed to resolve which of these hypotheses can best be supported by observable facts.

A further objective of this study is to reexamine the evidence concerning the correlation of the Stonehenge formation of central Pennsylvania with the Stonehenge type section in Chambersburg, Pennsylvania, as well as review the correlation of the Stonehenge formation with the Tribes

Hill formation in the Mohawk Valley, New York. Comparisons between the Stonehenge of central Pennsylvania and its correlatives in other regions are made in order to indicate the degree of variation or persistency of the lithobodies and faunas over a greater area.

Fossils and representative samples of the rock types were collected. The stratigraphic occurrence and relative abundance of the fossils were recorded and twenty-eight species were described in the appendix. Etched-section and thin-section studies of samples of all the major rock types were undertaken to investigate the characteristics and arrangements of component mineral grains and crystals, and were supplemented by investigations of a more limited number of samples, using the techniques of Differential Thermal Analysis, X-ray Diffraction, and X-ray Fluorescence. Some studies also were made of insoluble residues.

The Stonehenge limestone has been subdivided into four members based on relative differences in the predominant rock types and their cyclic arrangement. The upper and lower members are characterized by thin-bedded calcarenites and calcirudites whereas the middle member contains an abundance of thick-bedded algal and fine-grained limestones. The basal Spring Creek member contains oolites which are absent in the overlying pebbly Graysville member. Algal and aphanitic limestones mark the next higher Baileyville member, and oolitic fossiliferous calcarenites and calcirudites are indicative of the Logan Branch member at the top of the formation. The formation is about 430 to 485 feet thick in central Pennsylvania.

Key lithologic beds and faunal zones of the Stonehenge that are, in part, independent of lateral dolomite facies changes can be traced into the Larke and provide detailed correlation of the Stonehenge and Larke formations. Beds in the Larke dolomite containing relict fossils, oolites, and flat pebbles are correlative and equivalent with beds having similar features, only not dolomitized, in the Stonehenge limestone.

The Larke dolomite is subdivided into four members which are lateral extensions of the members in the Stonehenge limestone; in ascending order they are as follows: lower member, rudite member, middle member, and the upper oolite member.

The four members of the Stonehenge limestone in central Pennsylvania appear to be generally correlative with comparable members in the Stonehenge limestone at Chambersburg, Pennsylvania and the Tribes Hill limestone in the Mohawk Valley, New York.

The five most common rock types in the Stonehenge and Larke formations of central Pennsylvania are mechanical limestone, aphanitic limestones, algal limestones, finely crystalline dolomites, and medium to coarsely crystalline dolomites.

A benthonic fauna consisting of trilobites, small gastropods and brachiopods is found typically in the mechanical limestones. Larger cephalopods and ophiletid gastropods represent the common fauna associated with the aphanitic limestones. One new genus, *Palaelophacmaea* n. gen., and four new species, *Palaelophacmaea criola* n. sp., *Ophileta gigantea* n. sp., *Hystricurus platymarginalis* n. sp., *Hystricurus stonehengensis* n. sp., are described from the Stonehenge limestone.

The various rock types seem to reflect depositional environments which grade from non-restricted, normal marine conditions with strong bottom-current circulation

to restricted, penesaline conditions with weak bottom-current circulation. The rock types which grade from non-restricted to relatively restricted conditions respectively are the mechanical limestones, the algal limestones, the aphanitic limestones, and the finely crystalline dolomites. The finely crystalline dolomites may be precipitated directly from sea water or they may represent a penecontemporaneous replacement origin. In either case, they appear to be "early" dolomites. The medium to coarsely crystalline dolomites represent a post-depositional and later diagenetic origin and they may superpose and replace any of the earlier-formed limestone rock types.

Microfilm \$5.15; Xerox \$18.25. 404 pages.

STUDY OF THE METAMORPHIC HISTORY OF THE NEW YORK CITY AREA USING ISOTOPIC AGE METHODS

(L. C. Card No. Mic 60-17)

Leon E. Long, Ph.D.
Columbia University, 1959

Potassium-argon and rubidium-strontium age measurements have been made on mica separated from many rock types of the Manhattan Prong and New Jersey-New York Highlands. Most of the ages obtained on rocks from the Manhattan Prong are uniform within the experimental error at 365 m.y. Since this age is identical with those obtained by the U-Pb method by other workers on intrusive pegmatites, it probably represents the last major metamorphic event in the area. Mica ages in the Highlands at least 10 miles from the zone of complete recrystallization by the 365 m.y. event give isotopic ages of about 850 m.y. A transition zone shows apparent ages which range between these two. The apparent ages in the transition zone are determined by the extent of recrystallization which in turn is strongly dependent on the local structure. If the 1100 m.y. zircon ages obtained by Tilton et al. (1958) in the Highlands are accepted as defining the primary age of the basement in this region, major metamorphic events at 1100, 850 and 365 m.y. are indicated. Relict ages as old as 440 m.y. in the Manhattan Prong suggest still a fourth event if the time of deposition of the rocks of the Prong is Cambrian or later. This study illustrates both the difficulties and the power of isotopic geochronometry in areas of complex metamorphic history.

Microfilm \$2.50; Xerox \$7.00. 146 pages.

INVESTIGATIONS ON THE GRAVITY FIELD AND SHAPE OF THE EARTH

(L. C. Card No. Mic 60-803)

Urho Antti Kalevi Uotila, Ph.D.
The Ohio State University, 1959

One of the several developments covered by the dissertation is a method for high-speed computations of the undulations of the geoid. The method was used at the Mapping and Charting Research Laboratory in computing the internationally known 'Columbus Geoid,' as well as in detailed

investigations of regional areas in the northern hemisphere. In respect to determinations of the deflection of the vertical, the writer describes both a manual method, employing templates of original design in conjunction with mean anomaly stereographic charts, and a high-speed method he developed for computing the effect of distant areas on the computation point. Both have been used extensively at the MCRL.

Distances, N_h , between geopotential and spheropotential surfaces, having the same potential, were computed at elevations of 100,000 feet, 200 nautical miles, and 500 nautical miles. A profile is shown giving the N_h values at these elevations along the same parallel around the world. At 500 miles above sea level, the N_h values change very smoothly, but still have about the same magnitude as undulations of the geoid at sea level.

A system is presented that the writer conceived and organized for the uniform, high-speed handling of vast amounts of gravity data with IBM machines.

As a prerequisite for the diverse types of geodetic computations carried out at the MCRL, it was necessary for the writer to relate the many national reference stations throughout the world to the same world gravity system. Procedure used is discussed in detail. Gravity values in the Potsdam reference system for 124 national reference stations are shown in tabular form.

The existence, within limited areas, of a general relationship between free-air anomalies and land elevations is demonstrated through the use of tables and graphical illustrations. Mean correlation value, as determined from 115 samples throughout the world, is 0.118 mgal per meter for land stations.

A general technique is described that the writer used in determining and estimating approximately 10,000 $1^\circ \times 1^\circ$ mean free air anomalies throughout the world, taking into consideration various interpolation and extrapolation methods and correlations between free-air anomalies and station elevations. They have served not only as the base material for the MCRL but as the base material for recent investigations of the Army Map Service and other agencies in the United States.

In regard to accuracy of undulation values, mean standard errors caused by lack of gravity information on the undulations of the geoid were computed by the writer for the northern hemisphere, and are presented in map form. The mean standard error for most of Europe and the United States is about ± 9 meters. The maximum error in the northern hemisphere, as recorded in the Pacific Ocean and in northeast Siberia, is approximately ± 25 meters.

A procedure is described that the writer followed in balancing the world $5^\circ \times 5^\circ$ mean free air anomaly field in order to eliminate inadmissible spherical harmonics. The maximum correction to a single $5^\circ \times 5^\circ$ mean anomaly was +9 mgal, but many empty areas received systematical corrections.

The effect of these corrections on the deflection of the vertical at Meades Ranch is $\Delta \xi = +0''.14$, $\Delta \eta = +0''.24$. At Potsdam the effect is $\Delta \xi = +0''.03$, $\Delta \eta = -0''.10$. The correction to the undulations of the geoid is less than 5 meters in Europe and the United States, but, as expected, more than 10 meters in the Pacific Ocean.

Microfilm \$2.50; Xerox \$8.40. 185 pages.

HEALTH SCIENCES

HEALTH SCIENCES, GENERAL

THE SIGNIFICANCE OF CURRENT TRENDS IN SCHOOL AND COLLEGE HEALTH PROGRAMS

(L. C. Card No. Mic 60-724)

Mary Katherine Beyrer, Ph.D.
The Ohio State University, 1959

The school and college health program is broad in purpose, complex in nature and multi-disciplinary in scope. It plays a recognized, vital role in the total educational pattern. Like other professions, the field of school and college health is experiencing change and progress; it is not static, but moving. The purpose of this study was to determine the significance of the current trends in the evolution of the school and college health program.

Because the term trend has varied connotations and is casually used in many instances, the following definition was formulated for this study:

A trend may be considered as a general prevailing movement, changing in a specific and indicated direction, and thus reflecting a recognizable change of tendency or emphasis.

Identification was made of one hundred and four trends reflected in literature published in the field of school and college health education during the period from January, 1948, to May, 1958. A check list of these trends was sent to one hundred and forty-four selected school educators, public health educators and general educators who assigned value judgments to each trend. The value judgments were "A," denoting trends of utmost value, "B," indicating trends of lesser value and "C," signifying trends of little or no value. Of the 72.3 per cent of the check lists which were returned and usable, one-half were returned by school health educators and one-fourth by each of the other two educator groups.

Slightly more than two-thirds of the trends identified for this study were not mentioned as trends in school health in a 1943 study. Of the thirty-one trends identified in both studies, many of the trends in this study were implementations of the activity stated in the earlier research.

Eighty-three per cent of the total respondents assigned the judgment of utmost value to trends regarding the importance of the emotional health of the teacher and the health of all school personnel, acceptance of the school health program as part of the total educational panorama, concept of health as a state of well-being, concept of health education as a process which produces action by translating knowledge and attitudes into practices, responsibility of the family and classroom teachers concerning student health, and provision of in-service educational opportunities.

At least one-fifth of the respondents felt little or no

value inherent in trends which involve terminology changes; include driver training in school health programs; release students from school for medical and dental appointments; augment the quantity of health textbooks, health education literature and resources from commercial organizations; and attempt to include health learning experiences in all parts of the curriculum.

Statistical treatment of the data by the Chi-square test revealed fourteen trends about which the three educator groups showed the greatest difference of opinion.

Included as a result of the study are recommendations relative to discretion in the use of the term trend, the consideration of high ranking trends as guidelines in program planning, the further analysis and interpretation of group differences as a basis of multi-disciplinary cooperation, and the determination of the degree to which the trends judged to be of utmost importance actually exist in practice.

Microfilm \$3.20; Xerox \$11.25. 246 pages.

HEALTH SCIENCES, DENTISTRY

AN EXPLORATORY STUDY IN THE DENTAL STUDENT'S CONCEPT OF THE DENTAL PATIENT

(L. C. Card No. Mic 59-6988)

Regina Feiner Flesch, Ph.D.
Bryn Mawr College, 1959

This investigation is an initial attempt to identify the variables which comprise the concept, "the dental patient as a person," and to observe how that concept is utilized by the dental student in his view of the clinic patient. For purposes of the investigation, the student's view of the patient was divided into six areas, namely his view of the patient's general health, intelligence level, economic situation, socio-cultural background, emotional response to dental treatment, and view of the inter-personal relationship between patient and student-dentist. Each area was "operationalized" through six questions, a total of 36 questions making up a questionnaire which was given to 121 dental seniors at the University of Pennsylvania Dental School. At the same time of the administration of the questionnaire, the Allport-Vernon-Lindzey Study of Social Values was given.

The investigation revealed that the dental senior student does not have a view of the patient equal in all six areas. He tends to be relatively more aware of the patient's general health and intelligence level, first of all, than of the inter-personal relationship between himself and the patient. He is relatively less aware of the patient's socio-cultural and economic situations and of the patient's

emotional response. Statistical tests for significance applied to the data revealed significant differences in the student's view of the patient between all areas so tested except between ratings for awareness of the patient's emotional and economic situations. Ratings for these two areas, the lowest of all, revealed no significant statistical difference, when tested by the t-test. It was concluded that the student's view of the patient was equally poor in these two areas, and definitely uneven between the others.

Examination of free-response replies revealed that the dental senior tends to view the patient primarily in a dental situation frame-of-reference, rather than in a patient frame-of-reference. Replies to two open-ended questions were heavily weighted with references to dental procedures and problems, and contained far fewer references to other factors relevant to patients as persons. Tests were also applied to ascertain whether the student who obtained a high score on the questionnaire, indicating his high awareness of the patient as a person, also rated high in his class standing in the School. No correlation was observed between class-standing and questionnaire scores, a finding not surprising in view of the fact that the concept of the dental patient as a person has not yet been operationalized adequately. The Study of Values profile of the dental student was closest to those of engineering students and about half-way between those of medical and business students. However, due to the small samples from which several of the other professional profiles were obtained, and to the relatively large ranges of dispersion, comparisons must be made with caution. A significant correlation was found between the Study of Values "social value" ratings and the "socio-cultural" category ratings on the questionnaire. However, due to inherent differences in the method of construction, scales of measurement, and concepts which the two instruments measure, the correlation can be regarded as nothing more than a possible indication of a relationship which might be discovered with two more comparable instruments. Microfilm \$2.95; Xerox \$10.15. 225 pages.

HEALTH SCIENCES, NURSING

PHYSICIANS' APPRAISAL OF RESPONSIBILITIES ASSUMED BY GENERAL DUTY NURSES

(L. C. Card No. Mic 59-6598)

Nancy P. Chimera, Ed.D.
Boston University School of Education, 1959

Statement of the problem. -- The study was concerned with the construction of an inquiry form that would permit physicians to appraise certain responsibilities frequently performed by the general duty nurse in routine situations but, 1) generally considered to be the responsibility of other medical personnel or, 2) considered the responsibility of the general duty nurse by many but seldom performed by her.

Physicians were asked to appraise these controversial responsibilities as nurses traditionally receive impetus and authority from the physician for assuming new and different responsibilities.

Procedure of the investigation. -- A list of controversial responsibilities was gathered from the review of related research and literature. The list was used as a guide to interview and observe nurses and doctors working in Boston hospitals representative of those found in the United States employing the greatest number of general duty nurses. The list was refined on the basis of the interview-observation program. The guide list served as the nucleus for the preliminary form which contained 179 items. The preliminary form was evaluated by a jury of eight physicians, two from each of the four major clinical fields of medicine, who have a distinguished reputation nationally and internationally. The jurors were asked to make recommendations for improving the instrument, particularly as to any major omission and correction of the items. The recommendations and corrections were incorporated into the final inquiry form.

The final form was distributed to 300 medical specialists, (75 from each of the four major clinical fields; internal medicine, obstetrics, pediatrics, and surgery) who were practicing in Greater Boston. A 42 per cent response was received following a second mailing ten days after the first one. The desired distribution of responses, 25 from each field of specialization was obtained. The total distribution of the physicians responding was: internists, 32; obstetricians, 28; pediatricians, 36; and surgeons, 30 for a total of 126.

Findings and conclusions. -- Analysis of the data, Part I, General Techniques and Skills, indicated: 1) six items for which the majority of physicians, 60 per cent or more, felt the general duty nurse could assume responsibility, 2) 43 items for which opinion was divided, 20 to 59 per cent, among the respondents, 3) 37 items for which there was negative agreement, less than 20 per cent.

Analysis of the data, Part II, Communications, revealed: 1) four items for which the majority of physicians felt the general duty nurse could be responsible, 2) 37 items for which opinion was divided among the physicians, 3) 38 items which they thought was not the responsibility of the general duty nurse.

Analysis of data Part III, How Nursing Could Best Serve the Patient in the Future, indicated: 1) 90 per cent of the physicians thought the nurse should be primarily concerned with caring for the patient's personal and environmental hygiene, 2) 78 per cent by performing simple treatments and a minimum of technical procedures, 3) 68 per cent, by giving supportive care to the patient through communications, 4) 77 per cent, a nurse specialist would become more involved with technical procedures and complex treatment. The nurse specialist was included in the analysis of data only because of her relationship and significance for influencing general duty nursing practice. Other medical personnel that could be designated for the responsibility as technician, therapist, or physician are listed in Appendix C, tabulation of the data.

Part III of the study corresponds with Part I and II. Physicians do not think general duty nurses should become more involved with technical procedures but prefer a nurse specialist for performing these responsibilities. They did not think the general duty nurse should become involved in explaining, interpreting or teaching the patient.

The large number of items for which there was a divided opinion indicates a vacillation by physicians of responsibilities they expect the general duty nurse to assume which could be both perplexing and discouraging to

the general duty nurse. The finding of the investigation seems to substantiate a major reason for nurses leaving their positions was they had to assume responsibilities for which they felt inadequately prepared.

The findings of the study suggest: 1) committees of physicians and nurse educators and administrators who are leaders in the respective professions should come to agreement on responsibilities where there is a divided opinion in an attempt to define more clearly the general duty nurses' role, 2) the committees should make provisions for insuring adequate preparation of the general duty nurse in assuming responsibilities for which she may not have had sufficient preparation, 3) the committees' decision on responsibilities that are not those of the general duty nurse, a sincere effort should be made by all concerned to refrain from asking her to perform these responsibilities. Microfilm \$2.50; Xerox \$8.60. 190 pages.

**A STUDY OF THE ORGANIZATION AND UTILIZATION
OF AUDIO-VISUAL MATERIALS IN EDUCATIONAL
PROGRAMS IN NURSING FOR REGISTERED
PROFESSIONAL NURSES WITH
RECOMMENDATION FOR IMPROVEMENT**

(L. C. Card No. Mic 59-6585)

Lucy Caroline Perry, Ed.D.
Indiana University, 1959

Chairman: Lawrence C. Larson

Problem

The purpose of this study was to determine the ways in which audio-visual materials were being organized and used in nursing education programs, and to determine the conditions and factors that affect their use by faculty members.

Procedure

A questionnaire designed to determine practices being followed in the organization and utilization of audio-visual materials was sent to the 25 educational programs in nursing which agreed to participate in the study. All were listed as accredited for 1956 by the National League for Nursing. From among these, 11 programs were selected for visitation for interviews with individual faculty members to supplement data obtained by the questionnaire and to determine their practices and problems in using audio-visual materials.

Conclusions

The results of the study indicated: (1) a campus audio-visual center serving all departments of the university was the most desirable form of organization to facilitate use of audio-visual materials in nursing education; (2) audio-visual centers were not being used to the fullest extent possible by educational programs in nursing; (3) there was need for better coordination of audio-visual activities within the educational program in nursing; (4) educational preparation in the use of audio-visual materials seemed to be con-

ducive to greater use of these materials by faculty members; (5) physical facilities and equipment for use of audio-visual materials seemed to be fairly adequate; (6) procedures for the evaluation and selection of audio-visual materials were not well organized in the nursing programs; (7) records showing use, availability, and location of audio-visual materials were non-existent; (8) a variety of film and filmstrip catalogs were available to faculty members who procured most of their films through rental from sources outside the university instead of from the campus audio-visual center; (9) desirable practices in utilization of audio-visual materials were being followed by most individual faculty members; (10) faculty members would like to have more film subjects available which would be suitable for use in their classes; (11) few audio-visual materials were produced by faculty members or students; (12) records were not kept showing cost of audio-visual activities; and (13) faculty members did not consider the suggested deterrents to the use of audio-visual materials to be of very great importance.

Recommendations

The findings and conclusions of the study led to formulating some general recommendations as follows: (1) educational programs in nursing should work more closely with their university audio-visual center; (2) any effort to centralize audio-visual activities within the university should be supported by the nursing program; (3) educational programs in nursing should make use of the audio-visual services to the fullest extent possible; (4) educational programs in nursing which are preparing nurses for the teaching field should include audio-visual instruction in their preparation; (5) a faculty member should be designated as audio-visual coordinator to bring about more efficient use of audio-visual materials within the educational program in nursing; (6) effort should be made to equip all classrooms with darkening facilities so that audio-visual materials can be used as an integral part of class activity; (7) effort should be made by the nursing profession to secure subsidies for production of suitable films for use in nursing education; (8) arrangement should be made so that each faculty member will receive automatically her own university audio-visual center film library catalog; (9) an expansible card catalog of the audio-visual materials used by the educational program in nursing should be maintained to show what is available and where it is located; (10) a faculty committee should be appointed which would be concerned with instructional materials, including audio-visual aids; and (11) provision should be made to make supplies, materials, and equipment available so that faculty members and students can make their own inexpensive instructional materials.

Microfilm \$5.15; Xerox \$18.25. 402 pages.

HEALTH SCIENCES, PATHOLOGY

OBSERVATIONS ON THE CENTRAL NERVOUS SYSTEM
OF THE WABBLER-LETHAL MOUSE

(L. C. Card No. Mic 60-491)

Paul William Bernstein, Ph.D.
New York University, 1957

Adviser: Pinckney Jones Harman

Use of the Harman variant of the Marchi method has permitted a re-examination of the abnormal myelin present in the central nervous system of the wabblar-lethal mouse. In addition to the tracts containing Marchi positive material previously reported, i.e., vestibulo-spinal, auditory nerve root, juxtarestiform body, spino-cerebellar, brachium conjunctivum, rubrospinal, tectospinal, trapezoid body, lateral lemniscus, and medial longitudinal fasciculus, it has been found that the following tracts also demonstrate the presence of Marchi granules: acoustic stria, oculomotor, trochlear, trigeminal (sensory and motor), and facial cranial nerve roots, pallido-subthalamic and nigral, spinothalamic, medial lemniscus, stria terminalis, mammillothalamic, stria medullaris, optic, posterior commissure, medial forebrain bundle, mammillo-tegmental and all cerebellar lobes.

Studies on the temporal sequence of myelination in the normal mouse correlated with similar studies on Marchi preparations of the homozygous recessive wabblar-lethal mouse demonstrate a striking similarity. There is a time delay between the period of development in which any given tract first demonstrates a myelin sheath and the time that an alteration of that myelin is observed. This time lag amounts to a minimum of six days. Further, different tracts are myelinated at different periods of development and the alteration of the corresponding myelinated fibers in these tracts is demonstrated about six days later in each case. It seems that the single gene effect does not take place during a critical period of development but in a sequential pattern in accordance with the process of myelination. On the basis of these observations one may postulate that an apparently normal process of myelin metabolism is followed by a catabolic process in the affected fiber tracts.

The staining properties of the wabblar-lethal myelin as examined by the sudan black B, sudan IV, Nile blue sulfate, plasmal, performic acid-Schiff, Weigert-Pal, and Marchi methods compare favorably with the reactions obtained for normal myelin but differ markedly from that observed in Wallerian myelin and in certain other forms of demyelination. This observation suggests that a chemical difference exists between the abnormal myelin of the wabblar-lethal on the one hand and that of Wallerian myelin on the other.

Wabblar-lethal myelin resembles first and second stage Wallerian myelin with respect to the Marchi reaction but differs from normal myelin. Wabblar-lethal myelin resembles normal and first stage Wallerian myelin with respect to its histochemical properties but differs from second stage Wallerian myelin. Thus, it appears that wabblar-lethal myelin can best be provisionally identified with first stage Wallerian myelin, i.e., with an early stage of degeneration, and/or incomplete synthesis characterized by physical dissociation of normal myelin components without concomitant chemical changes.

Microfilm \$2.50; Xerox \$3.00. 56 pages.

HEALTH SCIENCES, PHARMACY

STUDIES OF PREPARATIONS INTENDED AS
BARRIERS TO AQUEOUS IRRITANTS

(L. C. Card No. Mic 59-4432)

William Leonard Blockstein, Ph.D.
University of Pittsburgh, 1959

More than one hundred million dollars are spent annually in the prevention and treatment of dermatoses arising from contact with irritating substances. Of the many protective measures available, protective ointments or creams have a general acceptance by industrial and household workers. Many of these protective preparations have been marketed without published evaluation studies.

A method for the laboratory evaluation of water-resistant protectives was devised. This method made it possible to measure the change in pH of an aqueous solution surrounding an Alundum thimble coated with the protective and filled with an acidic or an alkaline challenging agent. Twenty-four commercially available water-resistant protective preparations and Petrolatum, U.S.P. were evaluated by the method. It was found that the preparations which were not of the vanishing-cream type afforded better protection than did those of the vanishing-cream type. Petrolatum, U.S.P. provided as much protection as did the better protective preparations.

All of the preparations were also studied by means of a closed-patch test assembly on the shaven abdominal area of rabbits. In general, the results obtained in this study agreed with those of the laboratory method, in that, vanishing-cream type protective preparations provided less protection than did nonvanishing-cream type preparations.

By the use of the methods described, it would be possible for a manufacturer to screen protective preparations in the laboratory, rather than undergo the necessity of extensive clinical and field trials on unpromising preparations.

Microfilm \$2.50; Xerox \$4.80. 91 pages.

HEALTH SCIENCES, PUBLIC HEALTH

A SAMPLING SURVEY STUDY
OF ARTERIAL BLOOD PRESSURE LEVELS
IN NASSAU, NEW PROVIDENCE, BAHAMAS, 1958
FOR DESCRIPTION OF LEVELS OF BLOOD PRESSURE
IN A POPULATION IN RELATIONSHIP TO AGE, SEX,
RACE AND OTHER FACTORS.

(L. C. Card No. Mic 59-6821)

Benjamin Charles Johnson, Dr.P.H.
University of Michigan, 1959

Previous reports from the Bahamas suggested that people in this area demonstrated high blood pressure levels. This fact implied the operation of possible environmental or genetic factors. These people reportedly represented somewhat of a geographic and genetic isolate and it was known that the water supply was high in salt.

It was essential that knowledge be gained of the distribution of blood pressure levels in the population,

subclassified by age, sex and race, in order to compare these levels with results of other population studies. To accomplish this, the plan of study involved implementation of a probability sampling scheme for selection of persons for study. This method made possible the extension of the data to describe the entire population from which the sample was drawn, subject to the calculated sampling error.

Findings of the study were:

1) A definite race difference was seen with the Negro exceeding the white race for both mean systolic and diastolic pressures at all ages beyond adolescence. The Negro systolic means tended to increase in arithmetic progression with age, while the white systolic pressures levelled off from early adulthood until middle life, after which a progressive increase in blood pressure with age was again seen. This finding suggests a true racial difference in the physiological adaptation to whatever stresses may encourage development of hypertension. It seems that the white race may possess at least a partial protective mechanism during early adult life which is not seen in the Negro.

2) A definite sex difference within race was noted, each race demonstrating lower mean blood pressures for women during the reproductive period. After this time of life the reserve was true, with means for blood pressure at a given age markedly higher for women than for men. The latter was particularly noteworthy for the white race.

3) Trends were observed toward increasing blood pressures with increasing heaviness of body build and increasing arm girth, both factors considered separately. These trends are less discernible in the white race because of smaller numbers, but are seen more definitely in the Negro throughout the age span.

4) Comparison with other population studies showed that in regard to progression of systolic and diastolic blood pressure with age for a given race and sex, the Negro and white races were not greatly different from their racial counterparts studied elsewhere in the world. This finding suggests that if a specific environmental factor is involved in etiology, it is not operative in this location to any greater extent than in other areas studied.

Microfilm \$2.50; Xerox \$6.40. 134 pages.

AN INVESTIGATION OF THE RELATIONSHIP OF HUMAN ABNORMALITIES OF STRUCTURE AND FUNCTION TO ABNORMALITIES OF THEIR DENTITION

(L. C. Card No. Mic 59-6820)

Russell Stewart McMillan, Dr.P.H.
University of Michigan, 1959

Seven hundred and sixty seven patients from two homes for the mentally retarded and one home for epileptics in Michigan were studied. The findings of the following medical diagnostic groups were tabulated and analyzed:

1) mongolism, 2) diagnoses associated with Rh incompatibility, 3) idiopathic epilepsy, 4) encephalo-ophthalmic dysplasia, and 5) oligoencephaly and oligophrenia vera.

Forty hypoplastic primary teeth were secured, sectioned and examined microscopically to determine the relationship of the hypoplastic lesions to the neonatal line. AX² analysis of all primary dentitions exhibiting hypoplasia of the enamel indicated a strong relationship between the

cervico-incisal position of the hypoplastic lesion to the weight of the child at birth. All hypoplastic lesions which were observed in the primary dentition in the form of a ring or a groove were interpreted as an accentuated neonatal line.

The differences between the pattern of hypoplastic lesions of the primary dentition observed to accompany encephalo-ophthalmic dysplasia and Rh incompatibility was striking. The group of patients classified as encephalo-ophthalmic dysplasia included, by definition, only children who were born prematurely. The high rate of hypoplasia of the enamel exhibited by this group was interpreted as an accentuated neonatal line and was confined to the labial and/or buccal surfaces of the teeth. These portions of the teeth are supplied by more terminal portions of their capillary networks and would be most readily affected by a deficiency of oxygen or other essential metabolites. The capillaries supplying these areas are also under pressure of eruption not experienced by the lingual surfaces. In 7 of the 8 instances of hypoplasia of the primary dentition associated with Rh incompatibility, no selection for any teeth or portions of teeth was noted. In these instances one might speculate that the damage was caused by an excess of bilirubin per se.

A significantly high rate of abnormalities of the oral cavity of mongoloids was noted for 1) congenitally absent teeth (35.06%), 2) teeth exhibiting abnormal morphology (34.48%), and 3) high palatal formations (33.33%). A high rate of these abnormalities was observed for mongoloids with primary dentitions and for mongoloids with permanent dentitions. Such observations suggest either that the insult or deficiency is operative over a long period of time or that the anlage of the primary tooth bud contains the morphological potential of growth for both the primary tooth and its permanent successor. A subjective evaluation of caries and periodontal disease indicated a high prevalence of periodontal disease and a low prevalence of caries for this diagnostic group.

The rate (22.20%) of hypoplasia of the enamel for idiopathic epileptics was markedly lower than the rate (50.60%) reported by Spitzer in 1950. The relatively high rate of hypoplasia observed in the cervical 1/3 for this group in both primary and permanent dentition indicated that these lesions may have had their inception in the postnatal period and may have been related to the onset of seizures per se.

The abnormalities of the oral cavity for patients diagnosed as oligoencephaly or oligophrenia vera were, in general, suggestive of interruptions in the formative process of the oral structures which occur later than the earliest oral manifestations associated with mongolism and earlier than those associated with encephalo-ophthalmic dysplasia. Some of the defects of morphology of the teeth were similar to the defects which have been observed in association with congenital syphilis, yet none of the patients were so diagnosed.

Temporal markers representative of three gestational periods and two postnatal periods have been described and utilized in this investigation. Such markers will be of value in retrospective and prospective epidemiological investigations of congenital malformations in assigning time of insult for the various malformations under consideration. These markers may also be of value in determining the nature of insults among the various classifications of congenital malformations.

Microfilm \$2.50; Xerox \$6.40. 134 pages.

HOST-PARASITE RELATIONS OF
THE LARVAL STAGES OF THE DIGENETIC
TREMATODES IN NORMAL AND ABNORMAL
SNAIL INTERMEDIATE HOSTS

(L. C. Card No. Mic 59-5586)

Richard Huyette Sudds, Jr., Ph.D.
The University of North Carolina, 1959

Supervisor: John E. Larsh, Jr.

Two series of experiments were performed to test the hypothesis that the free swimming miracidia of digenetic trematodes are attracted to suitable snail intermediate hosts by means of a specific chemotaxis. Certain bird and mammalian schistosomes were selected for the study because of their public health importance. To make a valid test of the hypothesis, it was necessary not only to record observations of the behavior of the miracidia in the presence of so-called normal (suitable) and abnormal (unsuitable) snail hosts, but also to study microscopically the tissues of these snails sacrificed at intervals after exposure. By using both external and internal observations, it was possible to appraise the attractiveness of the snail host for the test miracidia, and, in those penetrated, to follow the intra-snail development of the parasite as well as the tissue response of the host.

The study involved 4 different species of miracidia exposed to both normal and abnormal snail hosts. In all, 7 normal host-parasite combinations, and 19 abnormal host-parasite combinations, were studied. A total of 497 snails was used.

The results of the first series of experiments indicated that the miracidia contacted the snails by chance. After contact, the miracidia attempted to penetrate the 7 normal hosts, and 17 of the 19 abnormal hosts.

The observations made in the second series of experiments indicated that not all of the miracidia had pene-

trated the so-called normal hosts nor were 100 per cent infection rates common in these snails. In 6 of the 7 normal host-parasite combinations, the miracidia that succeeded in penetrating produced sporocysts that developed normally without producing a tissue response. In the remaining combination (*Physa gyrina* with *Schistosomium douthitti*), only a few miracidia penetrated, and these were killed within 24 hours by a rapid host-tissue response. Therefore, it is concluded that *Physa gyrina* is not a suitable intermediate host for *S. douthitti*. Tissue studies involving 17 of the 19 so-called abnormal host-parasite combinations revealed no indications of miracidial penetration in 12 cases. A few miracidia of one combination (*Stagnicola emarginata angulata* with *Trichobilharzia elvae*) succeeded in penetrating; however, these were killed by a rapid host-tissue response. In two other combinations (*Fossaria abrusa* and *Bulinnaea megasoma* with *Trichobilharzia elvae*), the miracidia penetrated and the resulting mother sporocysts began to develop. However, after 1.5 to 6 days the development of these parasites appeared to cease followed by a gradual degeneration. The host tissues surrounding these sporocysts appeared to be normal. The results of the remaining 2 so-called abnormal combinations were even more surprising. The miracidia of *Schistosomium douthitti* not only penetrated *Fossaria abrusa* and *Stagnicola emarginata angulata*, but the resulting sporocysts appeared to be developing normally in the four-day period covered in these experiments. There were no indications of a host-tissue response in the vicinity of the parasites. It is suggested, therefore, that these two snails may be normal hosts of *S. douthitti*.

It is clear, in the case of the host-parasite combinations studied, that the miracidia were not attracted to the normal snails by a specific chemotactic stimulus, but contact was a chance phenomenon involving abnormal hosts as well. Therefore, factors involved in penetration and intra-snail development governed the suitability of the snail hosts. Microfilm \$2.50; Xerox \$5.00. 97 pages.

HISTORY

HISTORY, GENERAL

THE ANTI-EXPANSIONISTIC ARGUMENT IN THE UNITED STATES PRIOR TO THE CIVIL WAR

(L. C. Card No. Mic 60-655)

Nolan Fowler, Ph.D.
University of Kentucky, 1955

Between 1784 and 1861 the boundaries of the United States underwent many changes with few decades passing wherein some new territory was not grafted upon the Union. Accompanying this acquisition of territory was a movement of American citizens to the new lands.

These twin happenings provoked a great deal of resentment among the older settled portions of the Union, and this study is an attempt to classify and to describe this resentment in so far as it was vocalized. The chief sources relied upon by the writer have been the antebellum news-

papers, magazines, pamphlets, and the records of debates in Congress.

This work has been divided into four major parts. Part I, titled "Constitutional Barriers," treats of the attempts of the anti-expansionists to prove that territorial expansion was a violation of the constitution. The following questions were the most important:

1. Could the United States annex a sovereignty, and if so by what method?
2. Was it constitutional to annex an area where slavery existed?
3. Was the use of force to acquire foreign lands a violation of the constitution?
4. Could foreign lands if annexed by the United States be made into states and admitted to the Union or must those areas remain in a state of colonialism?

5. Did the "new States" clause apply only to the original United States or could it be applied to annexed territory?

Part II, "Governmental Problems," deals with specific difficulties which the anti-expansionists were convinced would confront the United States Government if it followed an expansive policy. They thought that if the foreign territory were acquired by force, blood, money, and supplies would be required in vast quantities, and defense would be a difficult problem.

Many anti-expansionists feared an increase in the powers of the executive and military if we followed a policy of annexation. Others thought our republic could not survive if we expanded.

Part III, "Sectionalism and Expansion," could be called the heart of the study, for here it is that the anti-expansionists' belief that their own portion of the United States (that portion generally being New England) would be harmed by annexation is examined. Annexation, they said, would mean a great reduction of population in the old states, because so many would go to the cheap, fertile lands of the West. As a consequence, the costs of labor in the old states would increase. The westward trek will mean less business for the East. Political power in the older regions would be lost.

In part IV, "Ethics and Expansion," the moral side of the problem is considered. Territorial aggrandizement, the anti-expansionists pointed out, was an attribute of monarchies, despotisms, and empires, not of republics. This republic was established as an example in free government for the whole world, but if we embarked upon territorial expansion we could no longer adopt a holier-than-thou attitude.

Violation of the constitution, economic problems, harm to the old states, and unethical behavior were, in short, the evils the anti-expansionists saw in annexation.

Microfilm \$9.65; Xerox \$34.30. 762 pages.

FLOODS AND FLOOD CONTROL IN THE MISSOURI RIVER BASIN

(L. C. Card No. Mic 59-6377)

Louis George Johnson, Ph.D.
University of Missouri, 1959

Supervisor: Dr. Lewis E. Atherton

In response to a demand for cheap transportation the federal government started a program of work on western streams in 1824. In that year Congress authorized the President to improve certain western rivers. The President, in turn, delegated the task to the U. S. Army Engineers. The Missouri River was first included in those works in 1832. From 1832 to 1876 federal spending on the river was relatively sparse and limited almost entirely to snagging operations. Demands for river transportation far outweighed those for flood control even in the face of such overflows as the record-breaking flood of 1844, which swept a path of destruction from Kansas City to St. Louis.

In 1876 the Army Engineers recommended a program of systematic river control or regulation for the Missouri.

The basic idea of their plan was to force the stream to scour its own channel by stabilizing its banks and restricting its course. The program was initiated in behalf of navigational improvements, but a certain degree of flood control occurred as a result of the work. During the life of the Missouri River Commission, 1884-1902, such work was hampered by appropriations for specified localities--communities along the Missouri wanted protection and congressmen wanted federal funds spent in their respective districts.

Interest in the prevention of wanton destruction by the uncontrolled Missouri River became apparent during the second half of the 19th century. The slowly evolving flood-control movement waxed and waned for nearly a hundred years, but it progressed generally in the direction of increasingly greater efforts toward the prevention of damaging overflows until 1936, when Congress established a national flood-control policy. Factors creating greater interest in the prevention of floods included the growth of population and wealth in the area; the number and intensity of floods; the influence of outstanding individuals; the impact of national events; and the changing concept of the American people regarding the participation of the federal government in such activity. Theodore Roosevelt focused national attention upon the whole problem of water resources, including flood control. Three decades later Franklin D. Roosevelt revived public interest in natural resources. It was the New Deal that brought a federal program of flood control to the Missouri Basin.

The presentation of the Pick Plan and the Sloan Plan in Congress in 1944 exposed the competition for the basin's water and made public the struggle between conflicting interests. Meanwhile, the growing popularity of a proposed Missouri Valley Authority frightened the Bureau of Reclamation and the Army Engineers to a point of taking joint action to head off an MVA. An overnight conference between the Bureau and the Corps produced the Pick-Sloan Plan. It resolved conflicting interests on paper but not in fact.

The Pick-Sloan or Missouri Basin program can be strengthened by the adoption of certain recommendations. These include a centralized, legally empowered administrative unit; more attention to upstream phases of flood control such as small detention dams, soil conservation and better land management; a better plan for collecting and compiling hydrological data comprehensively, systematically and continuously; more extensive and efficient floodplain zoning; increased vigilance in flood forecasting; more consideration of a program of flood insurance sponsored by the federal government; and further study of the benefit to cost ratio of flood-control works, particularly in multi-purpose projects.

Microfilm \$4.70; Xerox \$16.65. 366 pages.

THE GOVERNORSHIP OF SPANISH FLORIDA, 1700-1763.

(L. C. Card No. Mic 60-415)

John Jay TePaske, Ph.D.
Duke University, 1959

Supervisor: John Tate Lanning

Administration of affairs in rugged, frontier Florida was not an easy task. The duties of governor demanded the untiring effort and patient attention of the most dedicated Spanish official. Florida served a purely military function. Strategically located on the Bahama Channel, it protected Spanish treasure fleets returning home with their rich cargoes of gold and silver. The colony also became a bastion against English and French encroachments on the Spanish Southeast and the Gulf of Mexico. The extreme military character of Florida prompted the need for a governor with wide military experience, a soldier schooled in military tactics and discipline. Without exception, the eighteenth-century governor fitted this military pattern.

Still, Florida was a frontier area of the Spanish Empire needing something different from the cumbersome but necessary machinery of imperial control prevalent in more civilized areas. The governorship thus demanded an official with varied talents, an all-purpose administrator. Military training was important, but it was not enough to meet the many pressing duties and obligations of the governor's office. In addition to his military duties, the governor had to assume wide political, judicial, religious, economic, and social responsibilities. Since he did not have the aid or advice of subordinate officials, he alone had to administer laws and decrees laid down by authorities in Spain, Cuba, or New Spain. He had to act as chief judicial officer within his colony and as referee in disputes among religious officials. He had to maintain those serving under him by means of a subsidy, shipped annually from New Spain (Mexico). Military policy, defense, and Indian affairs also fell squarely on his shoulders. The indigent, runaway English slaves, public festivals, and manners and morals were other vital matters he alone had the power or prestige to deal with.

In spite of these many responsibilities, the governor was chronically in a paradoxical situation. On the one hand, the frontier character of Florida placed wide, almost dictatorial powers in his hands. He had no assistants or agencies of government like the town council or court (*audiencia*) to inhibit or bolster his authority. Yet, on the other hand, the king and the Council of the Indies seldom left the governor to his own devices; they took major policy decisions out of his hands and put him under the protective wing of the viceroy of New Spain and the governor of Cuba, his immediate superiors. In addition, the governor depended exclusively upon the viceroy for money and supplies to sustain his colony and almost exclusively upon the governor of Cuba for troops, cannon and war supplies. Economic reliance upon the viceroy in Mexico City and military reliance upon the governor in Havana thus greatly reduced the governor's powers and gave his superiors a large share in formulating policy for Florida.

During the first half of the eighteenth century, official policy was to maintain the Spanish foothold in Florida without expending large sums of money. The colony thus retained the frontier characteristics that caused immense

difficulties for the governor. He had to pacify the Indians without adequate presents and to administer justice without the aid or advice of trained lawyers. With insufficient troops and a few rusty cannon he had to defend his outposts at Saint Augustine and Apalache. With poor financing and little other support he needed to promote a mission program among a group of quarreling friars. Over the vigorous protests of the powerful English governor in South Carolina, he had to care for runaway Negro slaves. Beyond all this, it developed upon him to provide for the poor and needy from an almost empty treasury. Yet, despite these many difficulties, the governor successfully carried out the holding policy laid down by his superiors. Without adequate funds and in the face of seemingly insurmountable difficulties, he kept the Spanish flag flying over Saint Augustine until 1763, when a diplomats' treaty turned the colony over to Great Britain.

Microfilm \$7.25; Xerox \$25.65. 569 pages.

HISTORY, ARCHAEOLOGY

TREE-RING DATING OF ARCHAEOLOGICAL SITES IN THE CHACO CANYON REGION, NEW MEXICO.

(L. C. Card No. Mic 60-484)

Bryant Bannister, Ph.D.
University of Arizona, 1960

Supervisor: Emil W. Haury

A total of 828 tree-ring dates, representing 46 different sites in the Chaco Canyon region of northwestern New Mexico, has been compiled from published references, records of the Laboratory of Tree-Ring Research at the University of Arizona, and recent dating work carried out by the writer. Whenever possible, these dates have been presented individually along with the species, type of sample, and site provenience of every dated specimen, and an accounting has been given of the collection and present location of the pieces, the people responsible for the dating, and any previous publication of the dates. Each date site has been discussed with respect to name, location, description, excavation, and the temporal relationship between the site and the associated tree-ring dates.

It has been shown that the correct archaeological interpretation of dates depends upon the satisfactory solution of two basic problems: (1) the time relationship that exists between the date of the specimen and the archaeological manifestation being dated, and (2) the complicating factor introduced by the possibility of exterior rings lost from a dated tree-ring sample. A third requisite for correct interpretation, an understanding of the symbols used in the listing of dates, has necessitated a detailed explanation of the various forms of presentation used with Chaco Canyon region dates.

An analysis of all the dates has revealed five broad occupational periods for the region, four of them delineated by the temporal clustering of dated sites, and a fifth period (typified by Mesa Verde sites) distinguishable mainly through archaeological considerations. The five

periods cover a span of 13 centuries from the late 600's to the present day and are characterized by (1) pithouse sites, (2) classic Chaco sites, (3) Mesa Verde sites, (4) Navajo-Refugee Pueblo sites, and (5) Navajo sites. Microfilm \$5.00; Xerox \$17.55. 390 pages.

HISTORY, MODERN

THE HIGHWAY AND CANAL SYSTEM IN EIGHTEENTH-CENTURY FRANCE

(L. C. Card No. Mic 60-628)

Turner Wharton Allen, Ph.D.
University of Kentucky, 1953

In the course of the eighteenth century the French undertook a singular program of highway and canal development. Essentially it was a government enterprise, directed first toward the improvement of the roads and bridges. For this work the first half of the century constituted a period of preparation involving the extension of royal authority in regard to the roads; the adoption for the main roads of the ancient system of gratuitous labor, the *corvée*; provision for additional funds; and the establishment of an Administration of Bridges and Highways equipped with a Corps of Engineers, Assembly, and School of Bridges and Highways.

The bulk of the work of construction and improvement took place between 1750 and 1789. It involved some 24,000 miles of roads, forming a system of first and second class highways radiating from Paris to the frontiers and connecting the principal provincial centers. Around three hundred major bridges were constructed, along with hundreds of lesser bridges and culverts. Both the roads and the bridges were distinguished by advanced scientific construction, and by the combination of functionalism with monumental beauty.

Eighteenth-century France inherited a fragmentary system of canals which included the Briare, Orléans, and Languedoc canals, and a series of small but important canals in the coastal region of the northwest. Due in part to the preoccupation with the highways, the extension of the canal system in the first half of the century was left to private initiative. By 1750 only a few canals had been added, and of these only the Loing Canal was of commercial importance.

From mid-century the government also took the lead in the development of the waterways. A department of interior navigation was added to the highway administration, and the more important canal projects were undertaken by the central government or, through a system of public concession, by the provincial administrations. By 1789 the Saint-Omer, Givors, Narbonne, Brienne, and Monsieur canals had been opened; the Charolais Canal was virtually completed; the Burgundy, Franche-Comté, Saint-Quentin, Beaucaire, Nivernais, and Dive canals had been begun; numerous other projects were in the planning stage; and the older canals had been greatly improved.

For the development of the highways and canals the Revolutionary decade constituted a period of interruption.

The administrative and technical organizations were preserved, but financial difficulties, war, and internal disorder halted the program of construction. Maximum efforts were required merely to keep the roads open. Except for the Charolais Canal the work on the canals was abandoned.

The improvement of the highway and canal system was accompanied by--as it had stimulated--a marked acceleration of political, economic, and social activity. It was reflected particularly in the extension and improvement of the postal and stagecoach services, and the commercial wagonage. The rivers, augmented by the canals, nevertheless retained their primacy as commercial arteries.

The movement for improved communications also touched the other nations of the Western world in the eighteenth century. The French had been in the forefront of this movement, and their achievements, at least by 1789, were unparalleled, and rivalled only by the turnpike and canal construction in England.

The program of construction began under the Old Regime was resumed in the nineteenth century. The plans, organizations, procedures, and principles developed in connection with the work of the eighteenth century provided the bases for subsequent advances, and form the foundations of the present French highway and canal system.

Microfilm \$9.20; Xerox \$32.80. 728 pages.

IMPACT OF THE WEST ON IRAN, 1921-1941: A STUDY IN MODERNIZATION OF SOCIAL INSTITUTIONS.

(L. C. Card No. Mic 59-6882)

Amin Banani, Ph.D.
Stanford University, 1959

In a world rushed into increasing interdependence by the rapid growth of science and technology, the study of the interaction and impact of civilizations upon one another is of utmost significance. The predominant share of growth and development of science and technology in the past six hundred years has taken place in the West. Concomitant with this accumulation of knowledge, and perhaps because of it, the West has also come to exercise a preponderant share of world power. It is, therefore, not realistic to speak of interchange and interplay of civilizations today, but of the impact of the West upon the rest of the world. Does this impact threaten a complete distortion of values and disruption of societies? Or does it augur a greater area of human understanding, a larger body of common ideals, and, ultimately, a greater possibility for social harmony and the political unity of nations?

A brief period in modern history of Iran is studied here with the above-mentioned questions in mind. The rise to power and the reign of Reza Shah Pahlavi, from 1921 to 1941, was a period of cataclysmic change. The European influences which had been creeping into Iran since the sixteenth century, finally won the day and the country underwent an intense period of Westernization. The face of Iran was perceptibly altered. The minds of people were stirred, awakened, and confused. The dimensions of the study, therefore, are not mere arbitrary dates of a ruler. Here is one of the infrequent occasions when chronology cooperates with the student of history by setting apart a short period worthy of individual study.

The consequences of the innovations in political concepts and institutions, the influence of modern state-inspired nationalism upon traditional social order, the creation of a modern national army, the growth of a large Western-patterned bureaucracy, the Westernization of legal codes and court procedure, the modernization and expansion of education, the introduction of technology into the economy of the country — these are the topics that comprise the main body of this study. It appears that much of the Westernization in Iran of Reza Shah was superficial. It affected the upper strata of the urban population but did not permeate all levels of the society. Furthermore, it was confined to physical and material planes only. In view of the extreme material backwardness of the country and the urgent need for the rudiments of human well-being, the program of rapid Westernization, with its emphasis upon scientific and technical projects, was on the whole beneficial. But its failures threaten to overshadow its benefits. Excessive chauvinism, virulent materialism, degeneration of public and private morality, indiscriminate imitation of the banal aspects of Western civilization, distortion and threatened loss of the best elements of the traditional culture, these and much more, are not to be remedied by a more thorough application of Western-inspired reforms. The West seems to have also lost its equilibrium due to many of the same causes.

The problems of modern Iran are but a segment of a universal ailment. The fusion of the East and the West, in their present state of disequilibrium, is not remedy enough. Nothing short of a rebirth of the spiritual values that once animated both the East and the West can hope to be adequate. Spiritual values that are firmly secured in their approach and applicability to the economic, social, and political needs of the modern world.

Microfilm \$3.55; Xerox \$12.60. 276 pages.

ANTONIO GRAMSCI
AND THE "ORDINE NUOVO" MOVEMENT:
A STUDY IN THE RISE OF ITALIAN COMMUNISM.

(L. C. Card No. Mic 59-6999)

John McKay Cammett, Ph.D.
Columbia University, 1959

Antonio Gramsci was the outstanding Italian Communist of the decade following World War I. He was also the author of the principal Italian contributions to Marxist theory. This dissertation is an attempt to elucidate the ideas of the young Gramsci, especially in the years 1919-1920 when he edited the weekly newspaper *Ordine nuovo*. Around this journal gathered a group which ultimately provided the Italian Communist Party with many of its most important leaders, men like Palmiro Togliatti, Umberto Terracini, Luigi Longo, and Mauro Scoccimauero.

The dissertation is divided into six chapters and an epilogue:

- I. PRELUDE IN SARDINIA
- II. THE FORMATIVE YEARS IN TURIN
- III. ORDINE NUOVO AND THE ITALIAN SOVIETS

IV. THE TURIN LABOR MOVEMENT IN 1920

V. TOWARDS THE COMMUNIST PARTY:
GRAMSCI'S FINAL BREAK WITH MAXIMALISM

VI. LIVORNO, JANUARY, 1921: THE FOUNDING OF
THE ITALIAN COMMUNIST PARTY

EPILOGUE: GRAMSCI AND ITALIAN COMMUNISM

After a brief description of Gramsci's early life in Sardinia and a summary of Italian politics and culture in 1911, the question of Gramsci's relationship to the city of Turin with its university and labor movement is discussed. Then, the story of Gramsci's rise in the Socialist Youth Federation of Turin and in the Turin Section of the Socialist Party during World War I is recounted. Until 1917, his activity was mainly journalistic, strongly influenced by the idealist philosophy of Benedetto Croce. Following the popular insurrection at Turin (August, 1917) against the war, Gramsci was elected Secretary of the Turin Section and participated in the Conference of Left Socialists at Florence in November.

The years 1919-1920 were a culmination of the young Gramsci's career. His newspaper, *Ordine nuovo*, became the focal point of Italian Socialist efforts to create a system of factory councils or soviets. Gramsci's work in establishing the councils met with wide success in Turin. His ideas concerning their functions and goals are of great interest.

In Turin, the struggle for the councils ultimately led to the general strike of April, 1920, and the occupation of the factories in September. Gramsci's political role in these struggles, his attempts to maintain unity in the *Ordine nuovo* movement itself, and the position of the movement in the Italian Left and the Communist International are principal topics of analysis.

Throughout 1920, Gramsci's allegiance to the directorate of the Italian Socialist Party became more and more tenuous. The story of his ultimate break with the Party leadership on questions of both doctrine and practice comprises a chapter in itself. A principal issue of this disagreement was the demand of the Communist International that all reformists be expelled from parties affiliated with the International. Gramsci supported Lenin and the International on this question in a long and complicated polemic with G. M. Serrati, the outstanding leader of the "Centrist" groups in the Italian Socialist Party.

The direct result of this and other disagreements was a Party schism which occurred at the Congress of Livorno in January, 1921. Gramsci and the *Ordine nuovo* group emerged as a major element in the foundation of the Italian Communist Party. With this event, the rather isolated and autonomous role which he and the Turin labor movement had played in the Italian Left came to an end.

The epilogue consists of an evaluation of Gramsci's contributions to Italian Communism both as leader of the Party and as author of the "Prison Notebooks," written during his long imprisonment from 1926 to 1937. Both these aspects of his career can be understood only with a knowledge of the work of the young Gramsci, especially the Gramsci of the *Ordine nuovo* period.

Microfilm \$3.95; Xerox \$13.95. 306 pages.

A HISTORY OF THE KENTUCKY PENITENTIARY SYSTEM, 1865-1937.

(L. C. Card No. Mic 60-645)

Robert Gunn Crawford, Ph.D.
University of Kentucky, 1955

Supervisor: Dr. Thomas D. Clark

Kentucky was among the first states to establish a penitentiary, but a firm conviction that convicts should constitute no burden upon Kentucky taxpayers predestined a policy of niggardliness and neglect. Various unsatisfactory experiments in penitentiary management succeeded one another until the lessee system gained acceptance in 1856, and continued in use until 1880. The state surrendered all practical control over the convicts and the penitentiary to the lessee in return for an annual rental. This arrangement satisfied only the lessee, who grew wealthy and became one of the political powers in the state. The state, meanwhile, spent large sums of money adding new buildings and repairing damaged ones, and the convicts were grievously mistreated in the "Black Hole of Calcutta."

A legislative investigation of the penitentiary, in 1880, resulted in the adoption of the warden system for control, contract labor within the walls for profit, and convict lease without the walls for profit and to ease the overcrowded conditions. The legislators also inaugurated the planning that created the branch penitentiary at Eddyville in 1890.

The contractors exercised actual control of the convicts: their food, clothes, bedding, and labor. The state did not assume responsibility for its convicts until 1898. Even this action did not dislodge the contractors from their control because successive state administrations sought to profit from the convicts' labor, and Democratic and Republican administrations considered penitentiary posts as patronage to be distributed among loyal party members. Care was taken not to coddle the prisoners who ate "coarse" food, wore insufficient clothes, received inadequate medical attention, slept in cramped quarters, and labored at the manufacture of hemp, the production of furniture, wagons, harness, hollow iron-ware, shoes, skirts, shirts, and automobile license tags. Those convicts leased to contractors for work outside the penitentiaries built railroads, dug tunnels, and mined coal; other convicts constructed turnpikes and highways for the state. The state received meager returns, but the contractors profited enormously from the labor of the brutalized and abused convicts. The 1890-91 constitution forbade outside labor of the convicts, but the demand for a highway system led to an amendment in 1916 that authorized the state to use the convicts for the construction of highways. Although the state placed the convicts on highways, the experiment proved unsatisfactory.

The convicts in Kentucky's penitentiaries were young and poorly educated. Their crimes varied; but an inordinate number had committed murder or manslaughter; and an even greater percentage had violated the grand larceny statute. The convicts seldom served their entire sentences. Most governors issued pardons freely, good behavior shortened the terms of the convicts, and parole became the rule instead of the exception. Probation, however, was little used before 1937. Some desperate convicts escaped, and others failed in violent and bloody escape-attempts at Frankfort and Eddyville.

The Frankfort penitentiary was erected in 1798, and, by 1817, it was already unsatisfactory because of its location and its size. It continued, nevertheless, to house the majority of Kentucky's convicts until the 1937 flood inundated it and forced its abandonment.

The principal sources for this study were legislative investigations, penitentiary reports, journals and acts of the general assembly, and newspapers.

Microfilm \$4.90; Xerox \$17.35. 383 pages.

KING, MINISTERS, AND PARLIAMENT, 1774-1784.

(L. C. Card No. Mic 60-405)

Murray Scott Downs, Ph.D.
Duke University, 1959

Supervisor: William B. Hamilton

This study of a crucial decade in British political history opens with an analysis of the various individuals and factions involved in the general election of 1774. For three years the new Parliament cooperated wholeheartedly with the efforts of King George III and the North ministry to enforce "due obedience" in the American colonies, and the bitter protests of the ineffectual, divided, and unpopular opposition were virtually ignored. Then, from 1777 to 1780, military reverses in America, the intervention of France and Spain, and domestic discontent over the financial burdens of an unsuccessful war contributed to discord and intrigue within the ministry and to mounting hostility within the House of Commons.

The King, identifying the maintenance of royal authority with the survival of the North ministry, demanded firmness and activity from his ministers and prevented any change in ministerial personnel which might diminish his political influence. After the disaster at Yorktown, however, royal insistence on firmness was carried to such lengths that the ministers, unable to initiate peace negotiations with the Americans, were abandoned by large numbers of independent members as well as many of their own supporters in the House of Commons.

The resignation of North in March, 1782, was followed in the space of two years by four successive ministries. The Shelburne-Rockingham ministry imposed sweeping changes of personnel and policy on the King, who nevertheless kept the ministry divided by cultivating Shelburne and resisting Rockingham and retained much of his personal authority.

The death of Rockingham in July, 1782, led to the creation of the Shelburne ministry. Shelburne accepted the political influence of George III, who actively solicited support for his new ministers. However, when it appeared that North and his colleagues were not to be returned to positions of distinction and influence in a ministry that was manifestly the King's, these men were driven by resentment and fear of exclusion into a bold alliance with Fox and the former adherents of Rockingham. The majority formed by this "unnatural" coalition in the Commons forced the resignation of Shelburne by disapproving the terms of the preliminary peace treaties. For over a month the King sought in vain to persuade the youthful Pitt, or anyone, to take Shelburne's place and to defy the hostile majority in the Commons.

In April, 1783, the King was obliged to surrender to Fox and North, who demanded "unlimited" authority over appointments and policies on the basis of their majority in the Commons. By using every device to demonstrate his desire to be rescued and by encouraging the ambitions of well-disposed politicians, George III was able to precipitate a coup in December, 1783, involving the defeat of the coalition's "infamous" India bill in the Lords, the subsequent dismissal of the coalition ministers, and the creation of a ministry headed by Pitt.

The new ministry, based upon the restoration of royal influence, gradually wore down the hostile coalition majority in the Commons through the profuse distribution of royal favors, the obstinate refusal of the King to dismiss his ministers, and the ultimate unwillingness of many of the independent members of the Commons to challenge the King's right to appoint his own ministers and to dissolve Parliament.

The landslide victory for George III and Pitt in the general election of 1784, due both to electoral management and to widespread revulsion against the coalition, demonstrated the fact that Britain was not prepared to accept the doctrines of Rockingham and Fox that political authority was a monopoly of the majority in the House of Commons and that the King should reign but should not govern.

Microfilm \$7.45; Xerox \$26.55. 586 pages.

HISTORY OF ANDERSONVILLE PRISON

(L. C. Card No. Mic 59-6949)

Ovid Leon Futch, Ph.D.
Emory University, 1959

This dissertation is an examination of events that occurred at Andersonville Prison and an attempt to determine the reasons and responsibility for the conditions which produced great suffering and heavy mortality among Union prisoners confined there.

Confederate officials selected Andersonville in southwestern Georgia as the site for the prison in late 1863 and construction began in January 1864. But residents of the community opposed the location of a camp in their midst, and their hostility, together with dearth of labor, tools and supplies, inefficiency of governmental bureaucracy, and ineptness of camp officials, so impeded the work that the stockade was unfinished in late February when the government began sending prisoners to Andersonville. Facilities were never adequate. Plans to erect shelter for the prisoners were thwarted by lack of materials, poor management, and constant arrival of prisoners before preparations could be made for their reception. By late June the prison originally intended for ten thousand inmates held over twenty-five thousand. The prisoners' principal water supply, a creek flowing through the stockade, soon became polluted by drainage from camp latrines and refuse from the cookhouse and bakery, which were located upstream on the banks of the creek. Prison officials neglected to lay off streets and prisoners were not required to construct their makeshift abodes in orderly rows; the hodge-podge structures which prisoners erected made proper policing practically impossible after the stockade became crowded. Filthy habits of prisoners and failure of their keepers to en-

force sanitary regulations contributed to unhealthy conditions. Insufficient cooking facilities necessitated issuance of raw food to the prisoners, who lacked fuel and proper cooking utensils. Rations were coarse and meager. Medicines were scarce and care of sick and wounded prisoners was shockingly deficient. These factors, added to the debilitated condition of prisoners arriving at Andersonville after long confinement elsewhere, and the introduction of contagious diseases into the camp, produced frightful mortality. Of 44,928 prisoners sent to Andersonville, at least 12,912 died. When Atlanta fell in September 1864, the Confederate government began removing prisoners from Andersonville; by the end of the month most of those able to bear transportation had departed. From that time until the war's end Andersonville was primarily a prison hospital.

After the war, Northerners accused Confederate leaders of conspiring to destroy prisoners of war and deliberately creating conditions at Andersonville which would result in excessive mortality. Captain Henry Wirz, commander of the interior of the prison, was hanged after a flagrantly unfair trial by a military commission which found him guilty of conspiracy to liquidate Union prisoners and of killing prisoners in cold blood. Former prisoners embellished their accounts of prison conditions and invented stories of Wirz' atrocities. Conversely, defenders of the Confederacy erroneously depicted Wirz as a gentle humanitarian whose heart was rent by the suffering of those in his charge, and sought to avoid shouldering responsibility for Andersonville by attributing conditions to Northern refusal to exchange prisoners. Neither of these explanations is realistic. A Confederate conspiracy to destroy prisoners of war existed only in minds distorted by the hatreds of war, and there is no credible evidence that Wirz ever murdered a captive. But to maintain that he was kind to Yankees and that he grieved over their misfortunes, or to excuse a nation for failure--even under adverse circumstances--to care properly for men it holds in captivity, is equally invalid. In taking prisoners the Confederacy assumed the obligation of providing them with the essentials of life, and its failure to do so is censurable.

Microfilm \$3.20; Xerox \$10.80. 245 pages.

WALTER BAGEHOT: VICTORIAN CRITIC.

(L. C. Card No. Mic 60-497)

Robert A. Greenberg, Ph.D.
New York University, 1957

Adviser: Professor William E. Buckler

In this study of Walter Bagehot I have endeavored to segregate the different phases of his thought, to direct my attention to them rather than to his individual works as such, and, above all, to explore their relationship to the many mid-Victorian difficulties to which they were, in the main, responses. My general method has been to recall the context within which Bagehot functioned, and then to assess his thought--economic, social, political, religious, and literary--according to the terms dictated by that context. The value of this approach is that it exhibits Bagehot's

versatility and, at the same time, provides a series of norms against which to evaluate his contribution to nineteenth-century speculation.

Chapter I outlines the various problems to which Bagehot responded, and then proceeds to a clarification of his attitude to the middle class. His lineage, youthful training, and experiences at University College, London, are shown to have predisposed him to identify with that class; his years at banking to have confirmed, and his editorship of the *Economist* to have formalized, his identification. The latter is then exhibited, indirectly, in his estimate of the aristocracy, and directly, in his economic theory.

Chapter II analyzes Bagehot's social philosophy; traces its indebtedness to Burke's concepts of prescription, exigency, and national character; relates it to Bagehot's desire (1) to minimize the institutional readjustments entailed by the recent empowering of the middle class, and (2) to reconcile the innovative and conservative tendencies of that class; and defines his idea of progress in light of this reconciliation.

Chapter III correlates Bagehot's social with his political philosophy, and studies the latter in terms of his response to the pressing issue of parliamentary reform. Desirous of protecting the interests of the middle class, Bagehot utilized Burke to refute the doctrine of "natural rights," to demonstrate that the circumstances of 1832 differed from those of the 1860's, and to recommend a return to the older, native system of varying qualifications for different constituencies. Dismayed by Disraeli's leap in the dark, Bagehot abandoned high ground, advised a policy of concession to prevent working-class unity, and placed his trust in the strenuous leadership of the middle class.

Chapter IV examines the development of Bagehot's religious views, first by turning to his early religious training, which, administered jointly by his Unitarian father and Anglican mother, deprived him, as he later said, of an "hereditary belief"; secondly, by evaluating in detail the metaphysical system he constructed with the aid of Kant and Bishop Butler; thirdly, by demonstrating the collapse of this system under the impact of Darwin's findings; and finally, by focusing upon the skeptical bent of his later thought.

The two sections of Chapter V are devoted to Bagehot's literary criticism. Part I appraises its general character, the fact that it consists exclusively of reviews, that Bagehot was troubled by his inability to verify the tenets of his aesthetic, that he suffered from, and complained of, the lack of an adequate critical vocabulary, that he intended his criticism to enlighten and guide the middle class, and that he deliberately adjusted his essays to appeal to that class. Part II is given to a detailed consideration of Bagehot's aesthetic principles. It identifies him with Aristotelians like Arnold and Ruskin, investigates their influence on him, as well as the influence of Wordsworth and Coleridge, and treats his views on mimesis, selection, pleasure, beauty, typicality, wholeness, and spontaneity.

Microfilm \$2.75; Xerox \$9.70. 212 pages.

THE COVENANTERS AND PARLIAMENT, 1640-46: A STUDY OF SCOTTISH RELATIONS WITH ENGLAND DURING THE BRITISH CIVIL WAR.

(L. C. Card No. Mic 60-612)

Charles Louis Hamilton, Ph.D.
Cornell University, 1959

The purpose of this thesis has been to describe and analyze the relations of the Scottish Covenanters with the English Parliament during the period 1640-46. Such a study was justified not only because of the value of the Scottish contribution to the outcome of the English Civil War but also because of the need to demonstrate the importance of security considerations in determining Covenanter policy toward England.

Historians have long recognized that Scotland was the pivotal power in the struggle between Charles I and the English Parliament. But too frequently they have misunderstood the principal reason behind the Scots' decision to aid the Parliamentarians. By 1641 the Covenanters had effected an ecclesiastical and civil revolution in Scotland, one which deprived the King of much of his political power and created a religious polity which was anathema to him. The Scots reasoned that without a close union with England, the New Israel, which the Lord of Hosts had permitted them to build in Scotland, would be lost. It was this fear which compelled them to work for religious union with their more powerful southern neighbor. Simple religious enthusiasm was important in creating the desire for Anglo-Scottish church union, but the decisive factor in determining the Covenanters' policy was security.

The Covenanters also believed that a military alliance in times of crisis, a permanent agency to arbitrate Anglo-Scottish disputes, and certain forms of governmental unity would so join them with the English that their future domination in Scotland would be insured. If possible this was to be augmented by an exchange of economic privileges and by the consideration of Scotland's interests in English diplomatic negotiations.

The course of the Civil War in England eventually forced the Covenanters to modify their policy toward Parliament. Their need to maintain close relations with England still existed, but the hostility of many Parliamentarians to the Covenanters' religious desires forced them to concentrate more on preserving a military union with England. By the end of 1646, when the refusal of the King to sanction the Solemn League and Covenant had removed the possibility of a Scottish-Royalist alliance, Covenanter policy aimed at simply retaining the friendship of the Lords and Commons. The Independents and the sectaries, with their heretical religious views and with the support of the powerful New Model Army, were a threat to Scotland. But the Covenanters, faced with a growing Royalist party at home and worried about a renewed invasion from Ireland, did not yet believe that the existence of Cromwell and his supporters justified adding the victorious English Parliament to Scotland's list of active enemies. Thus when the Lords and Commons demanded the surrender of the King, the Covenanters, although not without reservations, handed Charles over to the two houses and withdrew their army north of the Tweed.

Microfilm \$4.35; Xerox \$15.30. 337 pages.

THE RISE OF PANDOLFO PETRUCCI

(L. C. Card No. Mic 60-29)

David L. Hicks, Ph.D.
Columbia University, 1959

This is a detailed study of the political and social bases of Pandolfo Petrucci's rise to power in Siena during the last years of the fifteenth century. It is drawn almost entirely from primary source materials located in the archives of Siena, Florence, and Milan. Although limited in scope, the study's conclusions suggest a great deal about the nature of politics and society in Renaissance Italy, for Pandolfo was the product of his age and his environment. Siena in those years was undergoing a profound process of economic, social, and political change, and Pandolfo contributed to and benefited by that change. Siena, however, was not unique. Every other Italian state to a greater or lesser degree underwent similar change. What applies to Siena, therefore, has application elsewhere.

Pandolfo did not achieve political preeminence in the same way as the *signori* of an earlier day. He was not the "disinterested arbiter" among several rival socioeconomic classes, who stepped forward to establish civic peace, reform the outdated medieval government, and lead the citizens in war against an invader. Superficially, however, Siena presents a classic picture of such a situation. Between 1480 and the mid-1490's, five factions struggled inconclusively for control of Siena's government. Then, in 1495, Charles VIII and his French knights descended upon Italy, and shortly thereafter Pandolfo Petrucci emerged. But on closer examination the situation is seen to have been different in a number of important ways. In the first place, Siena's institutions were only medieval in appearance; in reality, the *Balia*, a new executive and legislative magistrature composed of leading citizens, had assumed most of the authority formerly held by the Consistory, General Council, and Council of the People. The *Balia* served as a substitute for tyranny, a device by which the Sienese could retain their republican traditions in an age when republicanism seemed outmoded. At the same time, the structure of Sienese society had evolved, and the social and economic reasons for factionalism no longer existed. What had been several socioeconomic classes a century before had become a single homogeneous class, fully equipped both politically and psychologically to compromise for peace among themselves when Charles VIII came, without the help of a "disinterested arbiter."

Pandolfo arose following such a compromise. He was a leading advocate of compromise himself and head of a body of provisional troops which he used to maintain civic peace. In the three years after 1495, he gradually assumed leadership of a pro-Milanese group in the Sienese government, and in the fall of 1498 he won a majority of the *Balia* to his support by arranging a treaty between Siena and Florence. Between late 1498 and his death in 1512, Pandolfo's power increased steadily. He eliminated his principal enemies, including his father-in-law, by assassination, and cemented his popularity through his political acumen, particularly in the field of foreign affairs. He successfully defended himself against Caesar Borgia, and succeeded in keeping Siena at peace when all of Italy was at war. Diplomacy was his principal concern and the principal means by which he gained and maintained power.

Pandolfo's authority was never unlimited; never was it

given official sanction. In legal terms, he was only one of a number of first citizens, members of the *Balia*. In actuality he was the unquestioned leader of the majority of the *Balia*, a kind of political "boss" of a quasi-oligarchy. He was in fact, if not in law, Siena's Prince, and was so regarded by contemporaries. However, authority was entirely personal, and his regime collapsed when entrusted to his much less capable sons.

Microfilm \$2.50; Xerox \$8.00. 173 pages.

DISSENT AND PARLIAMENTARY POLITICS
IN ENGLAND, 1661-1681:A STUDY IN THE PERPETUATION AND TEMPERING
OF THE PARLIAMENTARIAN TRADITION.

(L. C. Card No. Mic 60-37)

Douglas Raymond Lacey, Ph.D.
Columbia University, 1959

In this study of the political activity of the Dissenters and their part in the perpetuation of parliamentary traditions inherited from the Puritan Revolution, the primary focus is upon the politics of the Presbyterians and Congregationalists who sat in Parliament. The activity of these Dissenters and that of the Baptists and Quakers in parliamentary elections is also analyzed, as well as their lobbying, petitioning, and pamphleteering.

Failure of efforts to impose constitutional restraints upon the monarchy at the Restoration was followed by decisive defeat in the elections of 1661. Thirty-five members of the new House of Commons have been identified as Presbyterians or Congregationalists out of the approximately fifty believed to have been elected. At the outset these men functioned as the opposition and fought against various acts which deprived them of their local seats of power in borough and parish, or which augmented or confirmed powers of the Crown. By the time of the Triennial Act (1664) moderate Anglicans had become the leaders of the opposition, and Dissenters played a supporting role. This pattern changed after 1674 when the King abandoned efforts to grant religious freedom to non-Anglicans and adopted his new policy of alliance with the Anglican clergy and repression of Dissenters. His policy as embodied in the Nonresisting Test Bill split the Anglicans, and as a result the Presbyterian-Congregationalist group gained more weight in the parliamentary balance of power.

In spite of activity on the hustings, by-election results were disappointing prior to 1679. The number of known Presbyterians and Congregationalists in Parliament declined until there were twenty-three at the dissolution of the Cavalier Parliament. However, there were increases over this number in the 1679 spring and fall general elections of 52% and 78% respectively. The influence of the Dissenters in Parliament was greater than their numbers or the frequency of speeches indicated because of their conscientious attendance, their cohesiveness, and the prevailing parliamentary factionalism. Parliamentary influence also resulted from the strong support given to many moderate Anglicans in elections, and from Nonconformist lobbying, petitioning, and pamphleteering.

Throughout the two decades moderate Dissenters in Parliament sought to limit the king's actions and

constitutional powers and to increase the powers of Parliament. They became increasingly aggressive in these efforts after 1673, and came to share opposition leadership with the moderate Anglicans. The Dissenters' Restoration experiences had a generally tempering effect upon their political views. Although there was partial acceptance of the ideas from the Leveller tradition that there should be a guarantee of basic individual liberties in fundamental constitutional law and a more popular suffrage, the main tradition to which Dissenters adhered was that stemming from the Nineteen Propositions (1642) and the Treaty of Newport (1648). Furthermore, the tempering effects of Restoration experiences made their parliamentarianism less extreme in most respects. This did much to make possible the working alliance between the moderate Anglicans and Dissenters. It also made the Dissenters' contribution to the development of limited monarchy more empirical and effective than that of their predecessors in the Puritan Revolution.

When the major constitutional features of the Revolution of 1688 are considered in the light of the Dissenters' part in the parliamentary history of 1661-1681, it is evident that they made substantial contributions to the perpetuation and final adoption of highly important constitutional ideas which have since protected the interests of individuals and minorities. Herein lies the enduring significance of their political activity in this period.

Evidence concerning the religious positions of seventy-eight members of Parliament, and a discussion of the criteria, gradations, and evidences of Dissent are included in the appendices. Sources include new manuscript materials. Microfilm \$7.15; Xerox \$25.45. 562 pages.

THE PUBLIC LIFE OF JOHN ADAIR

(L. C. Card No. Mic 60-674)

William Garrard Leger, Ph.D.
University of Kentucky, 1953

John Adair was a product of the South Carolina back country. The American Revolution came when he was barely old enough to enlist in the army. During the dark days of the war in the South he served as aide to General Thomas Sumter. After the war he joined with Sumter and other political leaders of the uplands in an effort to wrest political control of the state from the tideland planters.

In 1786 Adair came to Kentucky. He was active in the campaigns against the Indians which culminated in the Battle of Fallen Timbers.

Adair belonged to the liberal faction in the political struggles that occurred in Kentucky in the period between the two constitutions. As a radical he was elected to the Senate of the United States in 1805. He was an independent in that body.

In 1806 Adair became involved in the activities of Aaron Burr. He maintained that the contemplated project was an invasion of Spanish territory in the event of war. Under orders from General James Wilkinson Adair was arrested and sent to Baltimore. He was released on a writ of habeas corpus and no charges were ever placed against him. Adair had shown an interest in Spanish territory before Burr and he continued in this interest until 1813.

The War of 1812 found Adair back in service. He conducted himself with distinction at the Thames River. Governor Isaac Shelby assigned him to the army of General John Thomas which was raised to aid Andrew Jackson defend the Southwest. Adair commanded the Kentucky troops at the Battle of New Orleans.

His subsequent quarrel with Jackson greatly enhanced his popularity in Kentucky and helped to elect him to the governorship in 1820. He was a leader of the "relief" party and recommended the establishment of the insane asylum, the school for deaf-mutes, the Louisville Hospital, and reforms in the penitentiary system. He secured the abolition of imprisonment for debt.

In Adair's later political career he was an active Jacksonian Democrat. He served one term in Congress as a representative of that party.

Throughout his long political career Adair exerted every effort to bring the services of government to all citizens. He fought for circuit courts, direct elections, and unrestricted suffrage. His administration is noted for its support to the university. His weakness lay in his lack of understanding of economic forces.

He firmly believed in legislative supremacy and his political career was centered around that principle in government. Microfilm \$3.50; Xerox \$12.15. 269 pages.

THE BOURGEOIS REFORM MOVEMENT IN WEST GERMANY: ENLIGHTENED BUREAUCRACY VS. ENLIGHTENED DESPOTISM IN BADEN, 1750-1792.

(L. C. Card No. Mic 60-443)

Helen Pauline Grit Liebel, Ph.D.
Northwestern University, 1959

In this dissertation it is proposed that the socio-economic life of Germany in the eighteenth century, and particularly that of southwestern Germany, may be compared with that of an underdeveloped area in the twentieth century. Baden's agricultural economy was suffering from underemployment of labor resources, capital was scarce, and there was little opportunity for industrial expansion of the kind that took place in England. The population grew, however, so that there was a mounting pressure on subsistence. Reforms were made, but they were not far reaching enough. The main pressure for reform came from an enlightened bourgeois bureaucracy which sought in its first attempt to institute a thorough-going rationalization of agriculture and limit the powers of the ruling prince by establishment of an independent judiciary. Markgraf Karl Friedrich, an "enlightened despot," was reluctant to follow the advice of his councillors, however, and endeavored to stop the onslaught of the bourgeois bureaucracy by deliberately barring them from the highest state offices and fell back upon an attempt to rule with noblemen alone. The bourgeois reform movement then shifted its focus to the regional governments where the bourgeois administrator could rule with greater independence.

The leaders of enlightened bourgeois bureaucracy in Baden, with whom this dissertation is mainly concerned, were Johann Jakob Reinhard (1714-1772) and Goethe's

brother-in-law, Johann Georg Schlosser (1739-1799), both of whose economic and political theories, religious philosophies, visions of Utopia, and actual reform programs and policies are analyzed and described. These men, like many of their compatriots, were of ancient bourgeois lineage and cannot, properly speaking, be considered the scions of a rising bourgeoisie. Rather than the rise of a new class, it is therefore more accurate to say that a change in the role concept of the bourgeoisie lay behind the reform movement of the eighteenth century in Baden, and perhaps elsewhere.

The bourgeois bureaucracy had in the past considered itself the servant of the prince and had as its chief interest the achievement of higher social status for itself and its family dynasties. In the course of the eighteenth century its members changed their attitudes so that they came to consider themselves the servants of the general welfare. There was certainly a very real and very deep difference between an enlightened despot, who worked for the greater glory of his dynasty and the improvement of the royal revenues, and an enlightened bureaucracy, which worked in statesmanlike fashion for the general welfare. Mercantilism was the policy of enlightened despots, but enlightened bureaucrats often held quite contrary economic views, which were sometimes similar to those of classical economic liberalism, but generally approximated closely those of Keynesian economics.

The reform program of the enlightened bourgeois bureaucracy foreshadowed the agrarian reforms made in the nineteenth century and the philosophy of the bourgeois bureaucracy already contained that historical sense which would come to characterize German thought in the nineteenth century. It is not too much to say that the origins of historicism are to be found rooted in the philosophy of enlightened bureaucracy.

The political views of the enlightened bourgeois bureaucrats were clearly liberal: absolutism was to be curbed, the enlightened bourgeois bureaucracy was to rule, and the estates were to be revived.

The origins of German liberalism and of historicism therefore ante-date the French Revolution; and the success and failure of the bourgeois bureaucratic reform movement in the eighteenth century is very closely related to the success and failure of German liberalism in the nineteenth century. Microfilm \$4.10; Xerox \$14.40. 317 pages.

**A CAUSE TO PLEAD:
THE POLITICAL THOUGHT AND CAREER
OF WILLIAM PENN FROM 1660 TO 1701.**

(L. C. Card No. Mic 59-6990)

Mary Maples, Ph.D.
Bryn Mawr, 1959

This dissertation is an attempt to place William Penn in the background of seventeenth century political thought. He early evolved a theory of fundamental or natural rights which consisted of liberty of conscience, person, and property, as well as rights of individual participation in government's legislative and executive functions by means of representation and trial by jury. When he received a grant of the province of Pennsylvania, Penn had the opportunity of translating those rights into a form of government. His

constitution for Pennsylvania protected those rights by providing a mixed polity, with its checks and balances, an idea which he derived from classical sources as well as from the ideas of contemporary theorists such as James Harrington and Algernon Sidney.

The most important cause to plead, as far as Penn was concerned, was liberty of conscience. In 1678-1681 he allied himself with the Whig cause in England in order to win that freedom, and championed Algernon Sidney in the elections of 1679-1680. In 1685 he became a courtier for the same reason, since it then appeared that James Stuart was most apt to grant toleration. In the latter case, at least, personal considerations also entered, because Penn had long considered the Stuarts his benefactors, and he looked to James to help him settle an important boundary dispute between Pennsylvania and Maryland.

Despite his affiliation with the Stuarts, Penn continued to be an advocate of mixed polity, convinced that it could best preserve the rights of both ruler and ruled. His adherence to this preferred form of government was most clear in his colonial experience. In Pennsylvania, Penn opposed the colonial assembly, which, as the democratic element of government, was trying to increase its authority. This, according to Penn, would destroy the balance which he had designed. But Penn's government was finally laid aside in Pennsylvania, replaced by one which vested greatest control in the assembly.

This defeat in the colony was due to his unfavorable position; he was caught between a demanding assembly and an equally demanding crown. To preserve his proprietorship, he was forced to obey the royal commands regarding colonial defense and enforcement of the Navigation Acts. To reduce royal antipathy toward the colonists, and to preserve them in their rights, he granted the desires of the assembly in the matter of their ascendancy over council and proprietor.

Penn was also concerned with the possibility of European peace by means of federation, a proposal he made in "An Essay Towards... the Peace of Europe." His knowledge of the law and of contemporary opinions on international law served to provide a basis for the application of the social contract theory to an international situation. This was among his last and most interesting tracts.

Microfilm \$3.40; Xerox \$11.95. 263 pages.

**THE ANGLICAN CHURCH
AND SOCIAL REFORM, 1830-1850.**

(L. C. Card No. Mic 60-678)

Earl William McGee, Ph.D.
University of Kentucky, 1952

For a century before 1830 the Church of England had been notorious chiefly for its neglect. Members of the lower clergy and bishops, with very few exceptions, paid scant attention to the spiritual and temporal needs of their flocks. They were exceedingly worldly.

Perhaps the chief weakness of the Church was the fact that it had failed to keep pace, both materially and intellectually, with the English society. The industrial revolution had brought a profound shift of population from the rural areas to new urban areas. The Church remained

primarily rural, and by 1800 was completely out of touch with great masses of people, especially the laboring classes in large cities. Intellectually the Church had failed to follow the new philosophical developments--particularly of Liberalism and Radicalism; it opposed the principles of utilitarianism and materialism. The Church remained rural and conservative, as society was becoming urban and liberal.

It was the terrible fury of the nation, after the Church's opposition to the Reform Bill of 1832, which suddenly awakened many churchmen to the realization that the Church would surely be destroyed if it continued to oppose the liberal trend of social reforms in the nation. Since the Church felt it could not engage directly in political reform activities, it took the next best course of launching reform programs of its own. Benefit societies for the relief of the poor sprang up everywhere under the leadership of churchmen, while the government had launched the New Poor Law, a radical reform of poor relief, which was designed to make the poor less improvident. Most churchmen aided their parishioners more than the Poor Law allowed, thus gaining their support.

The Church as an institution could not long escape the notice of the reformers, and especially so since the first public official to propose its reformation was the Tory leader, Robert Peel. Strangely enough, the reforms instituted within the Church were exceedingly mild, in comparison with the temper of the times.

Yet they were constructive and fair, and Englishmen hated the Irish who called so loudly for Church reform. The Radicals who demanded disestablishment of the Church were impolitic enough to join forces with the Irish faction. This frightened many responsible elements in the nation. Dissenters who were enemies of the Church did not want to see established a precedent of property appropriation. As a consequence the Church found many friends who stood by it and warded off the blows of its would-be destroyers.

Meanwhile, although the Church had accomplished much on its own, there was developing a group of liberal-minded bishops who realized that the complex problems of society could only be solved by legislative action. They supported whole-heartedly the New Poor Law and factory legislation. There was every indication that the Church had fully awakened by 1846 to a keen sense of social responsibility.

The Church, however, had by no means fully accepted the Liberal philosophy, and had not accepted the Radical democratic philosophy at all: it opposed the Chartists and the socialist, Robert Owen. In addition the Church opposed public education because it thought education was its task.

It was clear by 1850 that the Church had not altered its fundamental social and political philosophy. It was still opposed to the principles of Utilitarianism and Materialism. Yet, many churchmen were able to accept the practical implications of liberal reforms without accepting, necessarily, the principles on which they were based. The Church of 1850 had come to the realization its mission of spiritual and moral welfare could never succeed as long as people were ragged, hungry and sick. Where the Church in 1830 had been lethargic and insensitive to the needs of society, by 1850 it was in the van of the movement for social reform. Microfilm \$4.25; Xerox \$15.10. 332 pages.

**GOUVERNEUR MORRIS, 1752-1779:
THE EMERGENCE OF A NATIONALIST.**

(L. C. Card No. Mic 60-513)

Max M. Mintz, Ph.D.
New York University, 1957

Adviser: Professor Bayrd Still

When Gouverneur Morris departed from the Continental Congress in 1779, at the age of twenty-seven, he had already laid down the principal outlines of the public policies he was to pursue for the remainder of his career. His greatest moment was yet to come in the Constitutional Convention, where, with James Madison and James Wilson, he led the successful drive for the formulation of a strong central government. Viewed in this perspective, his early years seem a remarkably thorough preparation for the future.

Born with brilliant mental gifts, distinguished appearance, and high spirits; bred in a social environment which instilled the habit of command; heir of a family tradition of individualism and championship of self-government; schooled in a liberal education at King's College and prepared for the law in the office of William Smith, Morris formed his political ideas at a time of seething controversy between the colonies and Great Britain. His distrust of human nature and his concern for orderly government impelled him to advocate reconciliation with Britain, rather than let loose an equalitarian movement which threatened to upset the established social structure. Nevertheless, when independence became inevitable, he cast his lot with the Patriots. His thoughts turned to a united America, organized on a national basis and geared to a commercial expansion which would foster the rise of a new and virile nation. Thenceforward, with characteristic acceptance of realities, he was an implacable foe of conciliation.

He entered politics in 1775, as a member of the New York Provincial Congress, and from the day of the Declaration of Independence he directed his efforts toward the creation of centralized government with a consistency and singlemindedness which is probably without parallel among those who later sat in the Constitutional Convention of 1787. In the New York constitutional convention of 1777, he unsuccessfully fought for a strong executive, with veto and appointive powers. In the Continental Congress he ably championed the cause of Washington's impoverished army. He guided Washington's requests for army reorganization and officers' pensions through the legislative gamut. He personally supervised the administration and reorganization of the army supply departments with a business acumen for which he early achieved distinction. In the realm of foreign affairs he acted from the conviction that the success of the American cause as a national undertaking depended upon the support of the French alliance, and he fought the expansionist ambitions of the New England and Southern States because he feared that they would alienate France.

And after having gained intimate knowledge of the shortcomings of the Confederation, he drew up a master plan for creating an executive arm of government; building national credit on the basis of a single national currency, sale of western lands, and taxation; and assimilating the western territories into the union through the admission of

new and freely organized States on an equal basis. The scheme failed of passage in the Congress, but no other prominent public figure of the day is on record as having thus advocated so early the kind of government which was established in 1787.

In all the official positions which Morris held, his abilities won quick recognition. He seemed to be regarded as one who knew how to get things done efficiently. He could think on a large scale, he could master details, and he could write lucid reports. The reputation he earned anticipated the responsibility that was put upon him in the Federal Convention of 1787.

Microfilm \$2.75; Xerox \$9.45. 210 pages.

A CONSTITUTIONAL HISTORY OF VIRGINIA, 1776-1860.

(L. C. Card No. Mic 60-268)

George Brown Oliver, Ph.D.
Duke University, 1959

Supervisor: Robert H. Woody

By 1776, a frame of government which formed the base for the Constitution of 1776 had been developed in Virginia. The governor, the council, and the House of Burgesses served as the Virginia equivalent of King, Lords, and Commons. Colonial government did not reflect separation of powers, since the council exercised legislative, judicial and executive functions. On the lower levels of government, the county courts combined all of the functions of local government. The county court, a self-perpetuating body, was far from democratic, but served a useful purpose in the colonial period.

Virginia adopted her first constitution in 1776. The constitution was never submitted to the people for ratification, but was considered binding by the courts. George Mason was largely responsible for the Bill of Rights and the Constitution of 1776; Jefferson's influence was also strong. Shortly after the end of the Revolution, a strong movement was initiated to revise the constitution. Jefferson and Madison were foremost among the advocates of reform, while Henry successfully led the opposition. Critics felt that the governor had insufficient authority and that the powers and framework of the General Assembly needed revision. Western counties demanded additional representation, and many reformers wanted broader suffrage provisions. After the War of 1812, the reformers carried on an intensive struggle which finally resulted in the calling of the Convention of 1829-30.

The Convention of 1829-30 included many of the most distinguished men of the day. Its results, however, were disappointing to the western reformers. Representation was far from equalized, and suffrage provisions were so complicated that two decades of contested elections plagued the Commonwealth. Reapportionment of representation was called for in 1841, but eastern refusal to carry out the constitutional provision brought renewed western demands for constitutional revision. However, by the end of the decade, westerners were trying to postpone a convention until after the results of the census of 1850 were available to underscore transmontane population in-

creases. The eastern counties, cognizant of the western strategy, insisted on calling a convention in the fall of 1850.

The Convention of 1850-51 concluded with a western victory. The great battle of representation had been won and effective provisions for future re-apportionment had been made. Suffrage had been extended. In short, most of the demands of Jacksonian democracy were not realized in Virginia until 1851. As in earlier conventions, sectionalism was a powerful force. Sectional struggles over internal improvements and representation provide a center for the interpretation of the entire period from 1776 to 1860.

Until 1851, the governor's powers were limited and he was subject to annual election by the General Assembly. His prestige increased after 1851, when popular election for the office was instituted. Until 1851, the governor was also hampered by a council which like him was the servant of the Assembly. By 1830 many reformers considered the council anachronistic, and in 1850-51, there was little opposition to its total abolition. Until 1851, the General Assembly enjoyed virtual supremacy. The scope of the Assembly's activities was varied, but some of the more important sessions centered attention on internal improvements, slavery and banking. Trivial matters occupied far too large a part of legislative time. A disgusted electorate placed additional restrictions on the Assembly in 1851. The judicial system was revised several times. Chief problems concerned proposed amalgamation of chancery and common law jurisdictions and the delay in clearing dockets on all court levels. By 1860, the principle of judicial review was clearly established, although few laws had been declared unconstitutional. A significant step in 1851 was the curbing of the powers of the county courts.

Microfilm \$5.85; Xerox \$20.75. 457 pages.

GREAT BRITAIN AND THE UNIFICATION OF ITALY

(L. C. Card No. Mic 59-6724)

George Henry Reeves, Ph.D.
The University of Texas, 1959

Supervisor: R. John Rath

In the middle years of the nineteenth century liberal Englishmen looked with favor on the efforts of the Kingdom of Sardinia to unify northern Italy at the expense of the Austrian Empire, which controlled Lombardy and Venetia in consequence of the treaty settlement of 1815 and the petty states of central Italy by family connections and secret military agreements. English sympathy did not, however, extend to material aid, for in the wake of the Crimean war, the British nation had become reluctant to involve itself in any continental war.

For military support in driving the Austrians from northern Italy, Count Cavour, the Sardinian Premier and spearhead of the unification movement, was compelled to turn to France and Emperor Napoleon III. In the summer of 1858 the two men reached at Plombières a secret understanding that was to lead to war with Austria the following year. Although the details of this secret agreement were unknown to the rest of Europe, the conclusion of a state marriage between the Emperor's cousin and the daughter of the Sardinian king in January, 1859, made

evident to the diplomats that a family compact of some kind had been reached between France and Sardinia.

Because of their distrust of the Bonaparte ruler and their suspicions of his motives in Italian affairs the British court and the Conservative ministry drew closer to the Austrian government, and the British Foreign Secretary, the Earl of Malmesbury, used all the resources at his command in the early months of 1859 to prevent an outbreak of war in northern Italy. The personal mediation of Lord Cowley at the court of Vienna failed, and a proposed congress of the powers foundered on the problems of the composition of such a congress and the preliminary disarmament of the hostile parties.

In April, 1859, Austria demanded that Sardinia disarm on pain of war. Cavour rejected the ultimatum, and hostilities between France and Sardinia on one side and Austria on the other ensued. In less than three months, however, Napoleon III suddenly concluded a truce with the Emperor Francis Joseph at Villafranca despite the fact that only Lombardy had been freed from Austrian control. When from necessity King Victor Emmanuel accepted the incomplete settlement, the outraged Cavour resigned his office.

Concurrently with the war a series of uprisings in central Italy had overthrown the established governments in Tuscany, Parma, Modena, and the Romagna, and the newly established provisional governments clamored for the annexation of the states to the Kingdom of Sardinia. Under the terms of the Villafranca agreement, France and Austria sought to restore the dispossessed rulers, but Lord John Russell, who took over the British Foreign Office on July 1, demanded that the Italians be left to settle their own affairs. Napoleon III again proposed a congress on Italian affairs, which like its counterpart in the spring, was fated, however, never to meet. By December, 1859, the French Emperor had decided to renounce his alliance with Austria, draw closer to Great Britain, and let the Italians have their way in central Italy in return for the cession of Savoy and Nice by Sardinia to France.

Upon Cavour's return to power in January, 1860, he accepted the inevitability of the cession but wished to postpone it until after the central Italian states had been absorbed into the kingdom. Napoleon, however, in a speech on March 1 publicly demanded the "reunion" of the two provinces with France, and shortly thereafter the two governments concluded both a private and public treaty arranging for the transfer.

The British reaction to the Savoy and Nice affair was one of bitter recrimination against the Emperor for his obvious lack of disinterestedness in Italian affairs and his reopening of the dangerous question of France's "natural frontiers." Relations between France and Great Britain became strained, although there was little likelihood of war between the two powers. British enthusiasm for Sardinia, and for Cavour personally, was likewise diminished by the affair, but the subsequent exploits of Garibaldi rekindled Great Britain's sympathy for the Italian cause.

In April, 1860, insurrection broke out in the island of Sicily, and the following month General Garibaldi and the "Thousand" sailed from Genoa to support the revolt. The expedition was secretly favored by King Victor Emmanuel, but not by Cavour, who found it at first only another complication in the already confused diplomatic and political position in which he then found himself. When he saw the unbounded admiration that Garibaldi's phenomenal success aroused abroad, particularly in Great Britain, Cavour de-

termined to bring the movement under the control of the Sardinian government. Garibaldi refused, however, to turn over the reins of power, and the Sardinian Premier attempted to foment in Naples itself a revolution that would permit his forces to intervene and thus forestall the capture of the city by Garibaldi. His efforts failed, and Naples fell to the deliverer of Sicily in September, 1860. Sardinian troops were thereupon marched into Umbria and the Marches to prevent a Garibaldian invasion of Rome, which would involve the Italians with the French garrison there, or an incursion into Venetia, which would meet with serious disfavor on the part of Great Britain. King Victor Emmanuel entered Naples in November, 1860, at which time Garibaldi turned over the control of the south to the monarch and retired to his home at Caprera.

A retaliatory move by Austria, Russia, and Prussia against Sardinia's invasion of the Papal States was prevented by Lord John Russell's dispatch of October 27, 1860, in which he threw the entire weight of British moral influence on the side of the Italian nationalist movement. Under the circumstances the other powers of Europe could only accept the subsequent unification of the peninsula as an accomplished fact. In March, 1861, Cavour declared the Kingdom of Italy in existence. Venetia was added to the kingdom as a result of the Seven Weeks' War in 1866, and Rome was incorporated in 1870 upon the withdrawal of the French garrison. The Italians had at last realized a political unity, which before 1860 had been unknown in modern times. Microfilm \$5.35; Xerox \$18.80. 419 pages.

THE VICTORIAN CONSCIENCE IN ACTION:
THE NATIONAL ASSOCIATION
FOR THE PROMOTION
OF SOCIAL SCIENCE, 1857-1886.

(L. C. Card No. Mic 60-40)

Lawrence Ritt, Ph.D.
Columbia University, 1959

The National Association for the Promotion of Social Science (usually referred to as the Social Science Association) was established in 1857. Although its nominal founder was the veteran reformer, Lord Brougham, it was actually the creation of a competent and aggressive young barrister, George Woodyatt Hastings, the son of the founder of the British Medical Association.

The Social Science Association came into being primarily because of the need for a comprehensive and coordinated attack on the evils — ranging from infanticide and prostitution to improper sanitation and inadequate provision for education — which afflicted English society and bore most heavily on the working classes in the latter half of the nineteenth century. While middle-class fear of disease or social unrest was probably partly responsible for the society's preoccupation with the condition of the lower classes, it was chiefly motivated by humanitarian concerns. Its approach to social questions was characterized by a preoccupation with efficiency rather than considerations of sentiment, because the reformers of the S.S.A. — like the Benthamite bureaucrat, Edwin Chadwick — regarded themselves as administrative technicians and social engineers whose function it was to eliminate waste.

They were convinced moreover that the subjects with which they dealt were susceptible of scientific treatment, and that their deliberations would be the means of discovering a science of society — beliefs which many of their contemporaries did not share. The Association's claim that it was a scientific body was, in fact, rather flimsy, and its proceedings, in addition, were frequently dull, but in the 'fifties and 'sixties its annual congresses were regarded as important events and were well attended; even hostile newspapers like the *Times* devoted full pages to reports of its proceedings.

The society originally comprised five departments — Jurisprudence, Education, Punishment and Reformation, Public Health, and Social Economy. Minor changes in organization were made subsequently, and an Art Department was added in 1876. Twenty-eight annual meetings were held from 1857 to 1884. The 1862 congress met in London; the rest were held in such cities as Birmingham, Liverpool, Manchester, Sheffield, Leeds, Glasgow, Edinburgh, and Dublin.

The Association's popularity began to decline in the late 1860's. By the 1880's it was in serious financial straits; in 1885, for the first time since its founding, it did not meet, and the next year it was formally dissolved. Its demise was the result of a number of factors: the defection of part of its membership to competing reform groups, Hastings' domineering personality, a tendency to ignore local reformers, and the society's inability to attract audiences after it lost the titled patrons who had lent it the prestige of their names and reputations in its first decade. That this last was probably the most important single reason for the decline of the S.S.A. is indicated by the marked falling off in attendance which began in 1868, the year of Brougham's death.

The Association accomplished some highly useful work in its thirty-year existence. As a pressure group it influenced legislation on public health, education, law reform, housing, prison administration, and the legal position of women. It was probably even more effective in preparing public opinion, through its widely publicized discussions, for reforms which were adopted after the society itself had ceased to function. Its *Transactions* are a valuable source of information on the social conditions of the period, and its famous report on *Trades' Societies and Strikes*, published in 1860, is a remarkably objective treatment of a highly controversial subject.

Microfilm \$4.80; Xerox \$16.90. 373 pages.

THE PROVINCIAL GOVERNORS IN THE NETHERLANDS FROM THE MINORITY OF CHARLES V TO THE REVOLT

(L. C. Card No. Mic 60-41)

Paul Rosenfeld, Ph.D.
Columbia University, 1959

In the emergent Netherlandish state of the sixteenth century the Emperor Charles V founded his authority largely upon the native aristocracy, whose principal members functioned as chief advisers to the regent, as commanders of the standing army and as provincial governors. Service at the court of Burgundy and election to the Order

of the Golden Fleece had imbued the Flemish magnates with an unswerving allegiance toward the sovereign and with a keen awareness of nationality, embracing the whole of the Netherlands. In the eyes of Charles V and of his regents, the governors were agents of the Hapsburg policy of dynastic centralization. But the undiminished prestige which redounded to men of the sword, their tradition of independent action, their claim to political supremacy and their ceaseless striving for renown sometimes vitiated that monarchical conception of the stadholderate.

By the middle of the sixteenth century the "seventeen" provinces of the Netherlands were distributed into the following eleven governorships: Artois, Flanders, French Flanders, Frisia and its appendages, Gelderland-Zutphen, Hainaut, Holland-Zeeland-Utrecht, Limburg, Luxemburg, Namur and Tournai. Though the powers of the various incumbents differed markedly, especially with respect to judicial prerogatives and the right of appointing town magistrates, nearly all the stadholders possessed extensive political, administrative and military authority. They recommended most candidates for local imperial offices and for church benefices. With the concurrence of the provincial councils of justice they helped to formulate the imperial or royal policy toward their governorship and carried out that policy. As lieutenants of the sovereign, they functioned as chief negotiators with the provincial Estates. Unlimited tenure of office everywhere strengthened their authority.

The manner in which the governors exercised these powers hinged largely upon the extent to which the higher nobility could exert the preponderant influence within the central government. To a lesser degree, the incumbents' conduct was moulded also by the effectiveness of the regents' rule. During Margaret of Austria's two regencies (1507-1515, 1517-1530) the stadholders bade fair to convert their provinces into independent principalities by usurping such attributes of sovereignty as the unilateral nomination of town magistrates and of other officials. To eradicate these abuses, the new regent, Mary of Hungary (1531-1555), enacted drastic reforms in the stadholderates. She revoked the unilateral right of the Flanders and Holland governors to nominate urban officials, forbade hereditary tenure and further curtailed the incumbents' powers by drafting restrictive instructions for a majority of the governors. Though powerless to abrogate permanence of tenure, the queen of Hungary succeeded by these measures in reducing the stadholders to the bounds of a strict obedience to her authority. But that success owed as much to Mary's willingness to govern with the assistance of the grandees as to the sternness of her rule.

The appointment of the vacillating duchess of Parma to the regency in 1559, and her custom of transacting the affairs of state chiefly through the intermediary of nobles of the gown renewed the estrangement between the provincial governors and the central authority. During the 1560's the stadholders manifested their disaffection by residing intermittently, by usurping wholesale the royal patronage and by striving to dominate the provincial Estates, as well as the administrative and judicial agencies of their governorships. In order to restrain them, Philip II attempted to divide the larger stadholderates and vacate them whenever incumbents died. The king even tried to resuscitate Queen Mary's plan of temporary nominations. But all these schemes foundered on the grandees' defiant resistance against any infringement of their political authority.

Three main conclusions can be drawn from the above evidence: 1. Johan Huizinga's portrayal of the Burgundian aristocracy, in his *Waning of the Middle Ages*, as a useless and even parasitic class reflects the prepossessions of his generation rather than historical reality. 2. Edmond Pouillet's contention, in *Bull. Acad. roy. de Belgique*, 2nd ser., XXXV (1873), 362-436, that the gubernatorial instructions endowed the stadholders with almost unlimited authority can no longer be regarded as valid. 3. By the breadth and complexity of its functions, and even by the extent of its legal prerogatives, the institution of the stadholder shows a marked advance over the equivalent office in England and in France, often regarded as the most successful of the new nation-states of the sixteenth century.

Microfilm \$4.50; Xerox \$15.75. 350 pages.

FRÉDÉRIC OZANAM'S "PHILOSOPHY OF HISTORY."

(L. C. Card No. Mic 60-354)

Sister Mary Tarcisia Roths, AD.PP.S., Ph.D.
St. Louis University, 1959

DIGEST

Frédéric Ozanam (1813-1853), publicist, litterateur, historian, professor at the Sorbonne, founder of the Notre Dame Conferences and the Society of Saint Vincent de Paul, lived a short but full life in turbulent nineteenth-century France. Caught up in the dynamic intellectual atmosphere of the age, as men sought the answers to society's problems--the political struggle between the old order and the newly-arising liberalism, the impact of the industrial revolution on economic life, the tension among classes, augmented by the rapidly-growing proletariat, the problem of growing irreligion--Ozanam expressed his answer to these problems in a philosophy of history: a philosophy which resulted, not from isolated and empty theorizing, but from his close, personal touch with these problems in his day-to-day contact with the sufferings and sorrows of man.

The core of his philosophy of history was faith in God's providential government of the world. All of history, seen as a whole, presented a constant progress in civilization, with Christianity being the unique instrument employed by Providence to further that progress. Christianity, in fact, contains the meaning of all history: the pre-Christian ages which prepared for its advent, as well as all subsequent centuries which have witnessed its growth.

Progress in history, however, is not an invariable, upward movement. Ozanam saw a double force acting in history: Divine Providence and human liberty. With the element of man's freedom is introduced the possibility of evil; and thus history becomes a conflict between the two principles of good and evil, and the course of history shows alternating periods of apparent progress and regression. Still, progress, however invisible, is never completely destroyed, even in those ages which have seemed most dark in the history of man. In such times, God "keeps His hand on society" and does not allow civilization to collapse.

To demonstrate his thesis, Ozanam proposed to study those centuries in history which seemed to belie the idea of progress: the period from the fifth to the thirteenth centuries. His approach to history was avowedly apologetic:

he intended to show how Christianity was glorified by history; that if in these centuries the progress of civilization had been constant, as he hoped to prove, it was only to Christianity that this progress could be attributed. Above the events of history as man sees them--often apparently only the result of chance or of man's deliberation--Ozanam saw a Divine Plan, *le dessein de la Providence*, being realized unfailingly, served ultimately by both the good and the evil in history.

Applying his philosophy of history to the nineteenth-century world, Ozanam believed that here, too, there was progress, despite apparent degradation. Thus, he could view the changing political scene with hope rather than alarm, because he was convinced that man was progressing, under the guidance of Providence, toward democracy. The industrial progress, too, had its place in the Divine Plan, even though its evil aspects were often more visible than its good. To the social problem of growing class-conflict, Ozanam proposed Christian charity as the only possible solution. He saw as the special mission of the Church in the nineteenth century the effort to win the working classes, the mass of the people, to Christ. In this way the Church would be, as it had always been, the instrument of civilization.

In face of the superficial optimism based on a false notion of man's self-sufficiency--destined necessarily for bitter disillusionment--as well as pessimistic theories which despaired of nineteenth-century civilization, Ozanam's philosophy of history, founded on a profound faith in Divine Providence and on man's potentialities for good, was a refreshing doctrine of hope offered to the confused and troubled man of the modern world.

Microfilm \$4.10; Xerox \$14.40. 318 pages.

THE DEVELOPMENT OF SOCIAL POLICY IN THE CHURCH OF THE BRETHREN: 1908-1958.

(L. C. Card No. Mic 60-270)

Roger Edwin Sappington, Ph.D.
Duke University, 1959

Supervisor: Richard L. Watson, Jr.

In the five decades from 1908 to 1958 the Church of the Brethren grew and developed in its social policy from a group of people with the characteristics of a sect to a group that accepted many of the same patterns and ways as other Protestant denominations. From a program of social service almost entirely limited to its own members, the church accepted the idea that it had a responsibility for people outside of the church without regard for race, nationality, or creed.

The changes in the social policy of the Church of the Brethren are traced in the areas of the church's relationship to racial problems, economic issues, temperance questions, matters of church and state, and the ecumenical movement. The period of World War I witnessed a great wave of interest in the Church of the Brethren in social concerns, as manifested in the change in attitude toward such economic issues as membership in labor unions and the purchase of life insurance, the change in a willingness to support such social action campaigns as nationwide

prohibition by legislative means, the change in the traditional pacifism of the church which saw many Brethren youth join the ranks of the military forces, the change in attitude toward foreign people which enabled the Brethren to raise \$250,000 for Armenian relief, and the change in attitude toward other churches as demonstrated in the Brethren participation in the Interchurch World Movement.

The greatest social concern of the church in the 1930's was the effort to keep the United States out of war, and if that should prove impossible, the effort to prepare the members of the Church of the Brethren for the coming of war. The Emergency Peace Campaign and the Spanish Civil War relief programs were both aspects of this interest in preserving peace. When World War II did come, the Brethren established the Civilian Public Service program to provide an alternative service program for its conscientious objectors. During the war the Brethren prepared in many ways such as membership in the Federal Council of Churches and establishment of the Heifer Project for the supreme effort of maintaining a worldwide program of relief service in the postwar years. The Brethren cooperated with UNRRA, and helped to establish Church World Service and the Christian Rural Overseas Program.

The administration of the social policy of the Church of the Brethren changed as much as the policy itself. The development of this administrative organization culminated in the Brethren Service Committee in 1939, which was established to serve as the arm of the church in social service and social action. In its early years this Committee had the flexibility of a movement, but after it became a part of the General Brotherhood Board in 1947, it tended to take on the rigidity of an institution. As the price for permanent acceptance in the church, it had to sacrifice a considerable degree of its versatility and freedom.

A large factor in the development of social policy in the Church of the Brethren was the role played by a number of outstanding leaders of the church. Such men as J. H. B. Williams, M. R. Zigler, and Dan West stand out as individuals who shaped the policies of the church. Although they were members of the staff of the official boards of the church, they served not only as administrators, but also as policy-makers. To such leaders the Church of the Brethren is heavily indebted.

Microfilm \$6.20; Xerox \$22.05. 486 pages.

AMERICAN ATTITUDES TOWARD GERMANY, 1918-1932.

(L. C. Card No. Mic 60-792)

Klaus Ferdinand Schoenthal, Ph.D.
The Ohio State University, 1959

This investigation of the impact of American public attitudes on the foreign policy toward the German Republic is primarily based on files of the National Archives, Congressional debates and hearings, and a representative selection of materials from contemporary newspapers, magazines, and books. It brings out that most Americans retained some of their wartime hostility toward Germany in the first two years following the armistice; but that the nationwide public debate on foreign policy, which culminated in the fight over the Versailles Treaty in the Senate,

nevertheless resulted in a gradual differentiation of views, so that by 1920, five main attitudes toward Germany had emerged.

Each of these had a particular group of adherents. The pro-German attitude was mainly represented by German-language papers and supported by Socialists. The French language press, the American Legion, and some Louisiana and Northeastern dailies adhered to the pro-French attitude. The opinion of the liberals was primarily voiced in such magazines as the *Nation* and the *New Republic*. The internationalist attitude found expression in numerous papers, especially in the East; and a majority of papers and magazines, particularly in the West and Midwest, supported the isolationist demand for political non-entanglement in Europe.

From 1920 to 1923, only the pro-German and liberal minorities favored a close friendship with Germany. The separate peace treaty, the revival of trade, and relief activities promoted peaceful relations with the Germans; but friendly feelings did not as yet develop among the majority of Americans, even when an increasing number began to adopt the revisionist view that Germany was not solely responsible for the war.

However, in the same degree that relations with France cooled off during the Ruhr occupation, the majority of American papers and magazines became more sympathetic toward Germany. In the four years following the Dawes Plan, German-American friendship reached its peak. Large investments in Germany, growing trade, general agreement with Stresemann's foreign policy, and the acceptance by numerous Americans of the revisionists' refutation of Germany's responsibility for the war, all contributed to this development. By 1928 even the suspicion of the pro-French group, though it was from time to time revived by news of resurgent German right-wing militarists and secret armaments, had weakened under the impact of Locarno and the Kellogg-Briand Pact.

In the depression era of 1929-1932, however, friendly attitudes toward Germany suffered a twofold setback. The bank crisis of 1931 destroyed the confidence in Germany's economic stability and resulted in widespread accusations that the German government mismanaged its financial affairs. The most decisive change in public attitudes, however, was produced by the election of 1930 when Hitler emerged as a major danger to the republican order in Germany. In the two years following this election, therefore, the fear of a German dictatorship threatening world peace and American investments caused universal apprehension among the adherents of all five attitudes discussed.

Throughout the entire period, the isolationist attitude had the most numerous and powerful adherents. Thus the separate peace treaty with Germany was forced upon the State Department by a band of isolationist Senators, and the isolationist desire to prevent the Government of the United States from engaging in any active policy in Europe reduced the influence of American diplomacy to a minimum when the Dawes Plan and the Young Plan were negotiated. Under these circumstances, the State Department was too weak to direct economic foreign policy and especially lost control over the enormous loans to Germany when investment bankers felt free to evade governmental supervision. Only when private loans to Germany were threatened by default did the Administration dare follow its own plans. Thus the Hoover Moratorium stood out as the only major governmental decision affecting Germany which was

reached independently. Yet even then, the President had to be extremely careful in assuring himself of strong Congressional support.

Microfilm \$3.70; Xerox \$13.05. 288 pages.

**WILLIAM ABERHART
AND THE SOCIAL CREDIT PARTY:
A POLITICAL BIOGRAPHY.**

(L. C. Card No. Mic 60-271)

Harold John Schultz, Ph.D.
Duke University, 1959

Supervisor: William B. Hamilton

The early history of the Social Credit party in Alberta is the story of William Aberhart. Although the Social Credit victory at the polls in 1935 was compounded of many ingredients, perhaps the basic elements were those of organization and leadership. It was Aberhart who provided both. He formed the Social Credit League, popularized the Social Credit theories, handpicked the candidates and led the party to power.

Aberhart began his career as a school teacher in Ontario. Moving west in 1910, he became principal of Calgary's largest high school, founded and directed the Calgary Prophetic Bible Institute, and won a vast radio following as a preacher of Fundamentalism and Bible prophecies. He also happened to be premier of Alberta from 1935 to 1943. Those years, however, are meaningful only when viewed in the context of his teachings and preachings for he never lost his pedagogic personality or relinquished his radio ministry. In all his positions he placed a premium on organization. Hedging between the ministry and teaching most of his life, Aberhart entered politics only when he was convinced that this was God's design. Once committed to this transcendental purpose, he entered public life with zest, and, like Gladstone, put a religious imprint on politics as surely as his personal life expressed a religious conviction. The premiership was merely the political extension of this religious conviction.

With this combination of politics and piety, Aberhart fashioned for himself a powerful organization to promote the doctrines of Social Credit which he accidentally picked up in Edmonton in 1932. Social Credit, as propounded by its author, Major Douglas, would end the paradox of "poverty in the midst of plenty" by exposing the bankers' manipulation of credit, establishing a "just price" and providing each citizen with a dividend to increase his purchasing power. Aberhart adapted these proposals to the immediate needs of the depression and sold them to the people as if the province were one big classroom and he was its teacher. When no political party would accept Social Credit, Aberhart galvanized his organization into political action in 1935 and won all but seven seats in the legislature.

Once in power, Aberhart never introduced the promised dividend. He soon realized that preachings often outran performance. Basic human and governmental problems still existed. Reacting to realities, the premier made Ottawa the scapegoat for his failures and reverted to the two areas he knew most about--administration and

organization. In 1938 he set up an "interim program" that preached monetary reform and practiced "good government." Elected to office by farm-labor votes, Aberhart became the spokesman for both in his debt and welfare legislation. As Minister of Education, he reorganized the educational system of the province. A shrewd party leader, he fashioned his program to the needs--and support--of voting blocs. If the Social Credit party failed to implement its namesake, it did make significant contributions in other areas. In 1940 he won a second term as the defender of debtors and the champion of labor and provincial rights. Before he could complete the organization of a national party, "the most famous school teacher of the day" died.

The history of the Social Credit party under Aberhart does not reveal any benefits that the same man and the same organization could not have provided under another label. Aberhart soon realized this but dared not admit it. But the story of Aberhart does reveal how one able man with a band of loyal followers, superbly organized, can exploit the circumstances of his day to win a premiership and a province.

Microfilm \$6.20; Xerox \$22.05. 488 pages.

**THE UNITED STATES
AND THE RUSSO-FINNISH WAR OF 1939-1940**

(L. C. Card No. Mic 60-521)

Robert Sobel, Ph.D.
New York University, 1957

Adviser: Professor John E. Fagg

The United States was an isolationist nation on the eve of World War II. This situation was caused by many factors, one of the most important being disillusionment with our involvement in the first World War. Senator Gerald Nye of Nebraska, attempting to ascertain the causes of our entrance into that conflict, began an investigation of the munitions industry in 1933. Straying from the avowed purpose of his committee, he also studied the activities of the Wilson administration in the period preceding the war. Nye concluded that economic pressures, combined with executive culpability, were the major causes for our entrance into the war.

Although these charges were not firmly substantiated, they were accepted and disseminated by isolationist spokesmen. Congress, believing that no president should be allowed the wide powers held by Wilson in 1917, set about placing checks on the executive. The most important of these were the neutrality acts, which were passed from 1935 to 1939 after being framed by the isolationist majority in the Senate. The legislation was criticized by Roosevelt, but he did not choose to exercise his veto powers on these occasions.

As the dictators gained in Europe and threatened to disturb the peace, Roosevelt tried to steer the United States toward internationalism. However, American isolationism was still strong when World War II erupted in September, 1939. The isolationists lost their power gradually during the next two years. One of the first episodes which served to aid the internationalist cause in this period was the Russo-Finnish War of 1939-1940.

The Soviet Union, fearing an attack by Germany, began consolidating her position in the Baltic in 1939. One of the keys to the defense of Leningrad was a series of Finnish bases near the frontier. The Kremlin tried to negotiate for the transfer of these bases, but was unsuccessful. When all else failed, the U.S.S.R. attacked Finland on November 30, 1939.

American sympathies were immediately enlisted in behalf of Finland. Relief agencies gathered funds and the press applauded the Finnish effort and damned the Russians. However, official aid in the form of arms and munitions was not forthcoming. Congress, remembering the results of loans and credits in 1914-1917, refused to grant assistance of this nature. Instead, Senator Prentiss Brown of Michigan introduced a bill which would authorize a non-military loan of \$10,000,000 by the Export-Import Bank. This bill became the battlefield for the congressional isolationists and internationalists. When it passed due to the defection of some anti-Russian internationalists from the isolationist coalition, it became clear that that philosophy was on the wane.

What is the importance of the Russo-Finnish War in the history of American foreign policy? To answer this question one need but study the differences in public attitudes in 1939 as compared to 1941. Between these years the United States evolved from an overwhelmingly isolationist nation into one which was willing to risk war in order to aid the Allies. The Russo-Finnish War served to undermine many isolationist arguments. It demonstrated that the isolationists were wrong when they assumed that the cause of modern war was basically economic, and that America could remain aloof if trade with belligerents ceased. Americans had no economic stake in Finland, and yet they had expressed their admiration for the Finns and their hatred of the Russians. Too, the war showed that Americans cared deeply about European affairs, even though they were not ready to fight for their sympathies. Thus, the Russo-Finnish War appears as one link in a long chain of events which eventually served to lead the United States out of isolationism and provided for a willingness to participate on the world scene in 1941.

Microfilm \$4.95; Xerox \$17.55. 388 pages.

JOHN W. TAYLOR,
THE RELUCTANT PARTISAN, 1784-1854.

(L. C. Card No. Mic 60-522)

Edward K. Spann, Ph.D.
New York University, 1957

Adviser: Dr. Ray W. Irwin

John W. Taylor typified the generation of politicians and legislators that followed the era of Revolutionary statesmen. Born and raised near the frontier in Saratoga County, New York, Taylor imbibed the political philosophy of the Jeffersonian Republicans. Inclined toward politics and law since his teens, he took up both professions after his graduation from Union College in 1803. His political apprenticeship lasted until 1811 when he was elected to the New York State Assembly. During his two terms, Taylor outshone many of his older colleagues, particularly in his

leadership in the Assembly of the unsuccessful opposition to the unpopular Bank of America. In 1812 he threw his growing political prestige behind De Witt Clinton's ill-fated bid for the presidency.

In that year, six months after the outbreak of war with Great Britain, Taylor was elected to represent Saratoga in Congress, his workshop for the next twenty years. The period between 1813 and 1821 was the heyday of his legislative career. During the War of 1812, he worked vigorously to improve the fiscal and military programs of the Madison Administration. After 1815 he fought to maintain and increase the leading role of the House of Representatives in American government. His career reached its zenith in the Missouri debates where he led in the House the attempt to bar slavery from the lands west of the Mississippi.

The Missouri controversy brought Taylor national fame, and in 1820 he was elected Speaker of the House. His success, however, embroiled him in the tumultuous politics of New York, despite his desire to remain above the party warfare of the State. He provoked the enmity of the Bucktails, the powerful enemies of Clinton, and it was these politicians who blocked his re-election to the Speakership in 1821.

Learning from his defeat that political independence was impossible, Taylor swung his support behind John Quincy Adams for the presidency in 1824. The victory of Adams brought, as a reward, re-election to the Speakership. While he was in the Chair between 1825 and 1827, the New Yorker had to face the disruptive partisanship of the enemies of the Adams Administration. In 1827 these enemies turned and defeated him for Speaker, the first national triumph of the newborn Jacksonian party. Angered by defeat and impelled by his protectionism and friendship for Adams, Taylor openly opposed the Jacksonians in 1828, only to see the National Republicans go down to crushing defeat.

In the years following, the former Speaker grew increasingly hostile to President Jackson. Although he backed the President's Maysville veto, he fought against the bank, tariff, land, and Indian policies of the new Administration and after 1830 became a leader of the anti-Jackson forces. In the effort to defeat Jackson in 1832, he helped to promote a coalition in New York between Antimasons and National Republicans, but that coalition failed to elect Henry Clay to the presidency. And it failed to re-elect Taylor, for he, too, was defeated on the issue of the National Bank.

After this involuntary but permanent retirement from Congress, he played a minor role in the founding of the Whig party, enthusiastically supporting William Henry Harrison for the presidency in 1836 and 1840. In the latter year, Taylor won election to the New York State Senate. A new career seemed to beckon, but in the autumn of 1841 he was partially paralyzed by a stroke and never recovered. His life dragged on for another thirteen years until finally in 1854 death brought its welcomed release from his miseries.

Microfilm \$6.35; Xerox \$22.50. 498 pages.

THE HAMAGUCHI CABINET:
FIRST PHASE JULY 1929—FEBRUARY 1930:
A STUDY IN JAPANESE
PARLIAMENTARY GOVERNMENT.

(L. C. Card No. Mic 60-50)

Arthur E. Tiedemann, Ph.D.
Columbia University, 1959

This dissertation examines the first eight months of the Hamaguchi cabinet and while giving a full account of the events of that period also uses them as a point of departure for the description of certain Japanese political processes and for the statistical analysis of a number of important Japanese political groups.

The dissertation begins by outlining the structure of the Japanese government. The extent of the Diet's power in financial and legislative matters is carefully delineated. The various independent agencies which administered the extensive powers of the imperial prerogative—the cabinet, the Privy Council, the military command, the imperial household minister, the lord privy seal, the *genrō*—are then analyzed. Next, the central and local organization of the two major political parties, the *Seiyūkai* and the *Minseitō*, is set forth. In this connection, a statistical analysis is made of 105 *Minseitō* and 70 *Seiyūkai* leaders.

The circumstances leading to the fall of the *Seiyūkai* cabinet of Baron Tanaka Giichi and the formation of the *Minseitō* cabinet of Hamaguchi Yūkō are explained. The background of the new ministers is given and the factors involved in the choice of second-rank political appointees are elucidated. An attempt is also made to measure the changes which the cabinet effected among the civil servants holding the top positions in the central and local government hierarchies. The retrenchment measures instituted by the cabinet as a foundation for its gold resumption policy are recounted in detail. An effort is made to set these policies in the context of Japan's modern economic development in general and of the economic trends of the 1920's in particular. Special emphasis is placed on the massive propaganda campaign waged by the cabinet to gain popular support for its economic program since this is an excellent example of the techniques available to the government for the manipulation of public opinion.

The political events of the fall of 1929 are narrated as a background for the election of February 1930. In the course of describing the election itself the following aspects are examined: the *Minseitō* and *Seiyūkai* platforms; the technical problems created by the multiple-seat district; the long- and short-range electioneering techniques; the role of bribery and the sources of political funds; and factors influencing electoral behavior. A statistical analysis of the election results indicates that the *Minseitō* was not merely an urban party but had considerable strength in certain types of rural areas.

The thesis concludes with a statistical analysis of the 466 men elected in February 1930 to the House of Representatives and the 379 men who belonged to the House of Peers in September 1930. The following points are included in the analysis: length of service in the Diet, geographic origins of the representatives, location of residence, family background, the number of *yōshi* (adopted sons) in each house, religious preference, age distribution, income level, education, experience in the civil service or military services, experience in local government, politi-

cal appointments, occupations, and connections with *zai-batsu* concerns. There is also a discussion of the ways in which seats in the House of Peers were obtained. The system by which nobles were elected to the house, the changing kinds of imperial appointees, and the types of men elected as highest taxpayer representatives are described. In addition, the principles according to which upper house political groups were formed are outlined, special attention being given to the reason for the failure of the lower house parties to extend their organizations to the upper house. An explanation is also given of the manner in which the *Kenkyūkai* was able to maintain a dominant position in the upper house.

Microfilm \$5.25; Xerox \$18.45. 410 pages.

GERMAN DIPLOMACY
IN SOUTHEASTERN EUROPE, 1914-1915.

(L. C. Card No. Mic 59-6414)

Glenn Edward Torrey, Ph.D.
University of Oregon, 1960

Adviser: Val R. Lorwin

The opening campaigns of World War One failed to produce the quick decision that, in their different ways, all the major belligerents had envisioned. The ensuing military stalemate greatly enhanced the importance of the nations that had remained neutral, particularly those in Southeastern Europe. Strategically located astride the flanks of the two warring coalitions, Turkey, Italy, Bulgaria, Rumania, and Greece each become the center of a diplomatic struggle between the Central Powers and the Triple Entente. The present study, based on portions of the microfilmed Archives of the German Foreign Ministry, is concerned with German policy toward these five countries, especially Italy, Rumania, and Bulgaria, during the first fourteen months of the war.

German diplomatic activity during the fall of 1914 resulted in few positive achievements. Although the Germans succeeded in maneuvering Turkey into the war in October, the military reverses suffered by the Central Powers on both the western and eastern fronts dampened Bulgaria's initial enthusiasm for all alliance and caused Italy and Rumania to move toward the Triple Entente.

As the military position of the Central Powers continued to worsen throughout the winter and spring of 1915, the German leaders used bribery, propaganda, and promises of territorial compensation in an attempt to bolster Austro-German influence in Southeastern Europe. They could easily offer almost unlimited amounts of Serbian territory to Bulgaria, but attempts to placate Italy and Rumania with Habsburg territory evoked sharp resistance from the Austrian government. German pressure on its ally to make concessions to Rumania in the Bukovina and Transylvania and to Italy in the Trentino became increasingly severe as the danger from these two nations increased and it seriously strained relations between Berlin and Vienna. Despite the German remonstrations, the Habsburg leaders refused to make the sacrifices demanded by Rumania and Italy. Late in April the latter entered into

an agreement with the Triple Entente and declared war on Austria a month later. Although a timely Austro-German advance on the eastern front dissuaded Rumania from following Italy's example, the government in Bucharest maintained an unfriendly attitude toward the Central Powers and continued to block the flow of German munitions to Turkey.

The miscarriage of all attempts to open a supply route to Turkey through the offer of bribes and concessions in Bucharest caused the German political authorities to renew an earlier demand that the high command open a corridor through Serbia by military action. But the military leaders, occupied with the campaign in the east, refused to consider the operation until Bulgaria's cooperation was assured.

By mid-summer, the Austro-German offensive in the east had completely changed the situation in Southeastern Europe. The Bulgarian government, which had been awaiting some sign that the Central Powers would be victorious, now dropped its reticence and opened alliance negotiations with Germany. As the price for its cooperation, the Bulgarian government demanded far-reaching promises of Serbian territory, a slice of Turkish Thrace, and generous financial support. Although there was considerable haggling over the details, the German government granted Bulgaria substantially all that she requested. On September 6, 1915, the alliance was signed in Sofia and a month later Bulgaria attacked Serbia in conjunction with the Central Powers.

This survey of German diplomacy in Southeastern Europe reveals that the objectives of German policy were almost wholly strategic in nature, designed to bring military victory to the Central Powers. Postwar political and economic plans for Southeastern Europe received little consideration and played an insignificant role in the determination of German policy. This study also discloses that German policy in Southeastern Europe caused serious and prolonged conflict between Berlin and Vienna. Despite the fact that Austria was the weaker and dependent ally, the German leaders found themselves powerless to force their will on the Habsburg leaders. The third important fact revealed by this study is the sharp disagreement that existed among the German leaders themselves over policy in Southeastern Europe. The political authorities steadfastly insisted that the key to German victory lay in a timely military operation against Serbia. The high command doubted the efficacy of this project and delayed action until the 1915 autumnal closing of the offensive in the east and Bulgaria's offer of cooperation made a campaign against Serbia more attractive.

Microfilm \$3.90; Xerox \$13.75. 304 pages.

THE RELATIONS OF THE UNITED STATES AND TURKEY, 1927-1939.

(L. C. Card No. Mic 59-6801)

Roger Reed Trask, Ph.D.
The Pennsylvania State University, 1959

The United States and the Republic of Turkey resumed diplomatic relations early in 1927 after a break of nearly

ten years. During the thirteen year period from 1927 through 1939 the two countries resolved most of the problems resulting from the estrangement of the preceding decade. This study analyzes the general relations of the United States and Turkey, with emphasis not only on treaty relations but also on various economic, cultural, social, and philanthropic contacts which contributed much to the expansion of Turco-American friendship.

Between the first formal treaty with Turkey in 1830 and 1927, Americans in Turkey restricted their work mainly to philanthropic and missionary activities and a small amount of trade. The severing of Turco-American relations in 1917 did not result in war between the two countries. The subsequent Turkish defeat at the hands of the European Allies in 1918, the nationalist movement under Kemal Ataturk, and the ineffectiveness of the 1920 Treaty of Sèvres delayed the resumption of formal relations with the United States. At Lausanne in 1923, an American-Turkish treaty was signed, but interparty political differences and determined opposition from Armenian-Americans caused the Senate to reject the treaty in January, 1927.

The State Department countered the Senate action with an executive agreement in February, 1927, providing for the exchange of ambassadors and procedures to regularize the relations of the two countries. Ambassador Joseph C. Grew and his successors, Charles H. Sherrill, Robert P. Skinner, and John V. A. MacMurray, succeeded in arranging treaties and agreements on commerce and navigation, establishment and sojourn, extradition, and claims. A reciprocal trade agreement in 1939 completed the formal structure of Turco-American relations. Only the intricate problem of nationality remained unsettled in the treaty relations of the two nations.

Individuals, representing a variety of more informal contacts, contributed much to growing Turco-American friendship. Congregational missionaries, although restricted by potent Turkish nationalism, maintained several schools and hospitals in Turkey. American archaeologists added considerably to the knowledge of Turkish antiquity. Technical advisers from the United States aided in Turkish economic development and administration, while numerous American business and industrial firms established branches in Turkey.

Turkey and the United States occasionally pursued similar policies toward issues in international politics. Attempts by the two countries to negotiate arbitration and conciliation treaties and Turkey's adherence to the Kellogg-Briand Pact illustrate this similarity. Except in instances affecting American interests, the United States remained politically neutral in regard to other European developments involving Turkey. The United States had little discernible influence on Turkey's position of friendly neutrality toward the Allies in 1939.

Rapprochement was the key development in Turco-American relations from 1927 through 1939. Groups like the American Friends of Turkey, the efforts of the State Department, and the admirable reform movement in Turkey itself, helped to dispel anti-Turkish feeling in the United States. Economic, social, cultural, and philanthropic contacts between the two countries continued to be important. While the United States pursued a policy of political non-involvement in Turkey, other contacts disproved effectively the idea that the United States followed a rigidly isolationist course during the period. The United States, confronted

with this early example of Middle East nationalism, adjusted admirably to it and accepted it in good faith. By 1939, the United States and Turkey were staunch friends.
Microfilm \$5.35; Xerox \$18.90. 419 pages.

KENTUCKY IN A DECADE OF CHANGE, 1850-1860.

(L. C. Card No. Mic 60-714)

Wallace Blythe Turner, Ph.D.
University of Kentucky, 1954

This study is an attempt to portray Kentucky in the 1850's in its significant aspects. Politics, slavery, anti-slavery, education, agriculture, transportation, commerce and industry, social and intellectual life are treated. Each of these topics is prefaced by a brief survey of accomplishments prior to 1850, and the developments during the decade are treated in considerable detail.

Politically, the commonwealth was in a state of flux after the death of Clay in 1852. The nominal demise of the Whig party was followed by a nativist movement called Know-Nothingism, which in turn was succeeded by a proposed new party under the label of Constitutional Union. Kentucky Democracy experienced a new birth in the fifties culminating in the election of John C. Breckinridge to the vice-presidency.

In spite of its slavery, the 1850's saw Kentucky more solidly dedicated to the Union. This seeming paradox was the result of Kentucky's geographic position. The state's economic life was dependent upon perpetuating her position as a corridor between the two sections. Furthermore, it was obvious to those with vision that in case of armed conflict the state would be tragically vulnerable.

Kentucky slavery was markedly different from that of the cotton belt. A larger number of slaveholders and fewer slaves per owner, plus a different type of agriculture set the stage for Kentucky as a slave market to supply the lower South. It was largely this phase of slavery in Kentucky that gave rise to the antislavery agitation. Cassius M. Clay, John G. Fee, Robert J. Breckinridge, Calvin Fairbank, and Delia Webster were some of the leading agitators for abolition or some milder form of emancipation.

Tobacco, hemp, mules, and blooded stock were significant items in Kentucky's agricultural life during the fifties. The first state agricultural society, culminating in the first state fair, and the mushrooming of local agricultural and mechanical fairs gave impetus to a more scientific type of agriculture. Improved farm implements, many of which were manufactured in the state, aided production and removed some of the burdensome toil.

Railroad building in Kentucky during the last decade before the war was of major proportions. Many roads were chartered that were never built, and several roads floundered financially but the total picture was wholesome for the state. Many of the railroads were conceived to connect inland cities with navigable streams, because the steamboat era still existed. The most comprehensive project was the Louisville and Nashville Railroad. The many vicissitudes accompanying its construction spanned the decade, and in 1859 through traffic was inaugurated from the Ohio to the bend in the Cumberland.

Robert J. Breckinridge is considered the founder of

Kentucky's public school system. As superintendent of public instruction during the early fifties he was called upon to challenge the governor on the question of the preservation of the school fund. His administrative ability and courageous leadership aided the creation of a public school system for the state. Kentucky's public education was so retarded prior to the Civil War that it was difficult to stimulate the people and the legislature to take a very aggressive stand.

The reform movement that swept the nation in the first half of the nineteenth century found a hearty response in Kentucky. By 1860 the state sponsored two insane asylums, a school for the blind and the deaf, and an institution for the feeble-minded. The penitentiary, however, was the weakest link in the state's institutional chain.

There was no paucity of literary figures in Kentucky during the fifties, but unfortunately most of them were not of the highest caliber. Joel T. Hart in sculpture, Gideon Shryock in architecture, and George D. Prentice in journalism were near greats in their fields.

Microfilm \$4.15; Xerox \$14.65. 324 pages.

THE NORTHERN MILITARY MIND IN REGARD TO RECONSTRUCTION, 1865-1872: THE ATTITUDES OF TEN LEADING UNION GENERALS.

(L. C. Card No. Mic 60-802)

William John Ulrich, Ph.D.
The Ohio State University, 1959

Ten leading Union generals have been studied in order to portray a cross section of the Northern military mind in its relations to the Southern question, 1865-1872. Included in this study are seven West Point graduates and three political generals. An attempt has been made to deal with, among other issues, the Negro problem, civil rights, labor relations and military governments. Once the fratricidal struggle was over, how would these military men behave and think? Would they be harsh and vindictive or mild and magnanimous toward their fallen adversary?

Since some significant officers were not included, one might ask what criteria were established for selecting the generals considered. Large amounts of material, published and unpublished, suggest these commanders as the leading and most representative ones in the field. The availability of the material also had to be considered.

After an examination of the pertinent facts, the writer concluded that Sherman, Hancock and Schofield were among the most lenient in their approach to the Southern question. Thomas gave evidences of a somewhat more strict attitude toward his native countrymen, although he harbored no bitterness in his heart toward them. Howard classified himself a Radical, but was fundamentally not one of that breed. His actions and opinions must be considered in the light of the fact that he was the Freedmen's Bureau Commissioner. Of the regular army men, Sheridan was the most harsh toward the former Confederacy. But even in this case, definite traits of leniency were evinced in the immediate postwar period. Early magnanimity was exhibited toward the South by Grant. This officer, undoubtedly influenced by his political advisers and

by his struggles with Johnson, drifted away from conservatism and mildness to espouse the cause of radicalism. In reality, Grant was a moderate who assumed the mantle of radicalism because of political necessity. He really was not vindictive by nature. Banks showed a conciliatory attitude toward the South even before 1865. Political considerations drove him, as Congressman, into the Radical camp and even though he voted most of the time with Stevens, it did not appear that he wholeheartedly espoused extreme views. Logan favored a conservative policy in regard to the South immediately after the conflict. The desire to be politically successful and an opposition to Johnson helped to mark Logan as a leading opponent of conciliation toward the South. The most thoroughly vindictive of the generals considered was Butler. In spite of his rather thick, harsh exterior, one could discern at times a moder-

ate strain which was apparent in his personal communications. Again political expediency was a probable factor which influenced Butler.

If the Northern generals could have directed reconstruction in the South, the story of that period might have been quite different. A definite lenient and conciliatory attitude in regard to the Southern problem was evinced in the immediate postwar era by all these officers with the exception of Butler. Political considerations largely, it would seem, weaned Logan, Banks and Grant, the latter two at least outwardly, away from their early positions. Sheridan was undoubtedly encouraged to pursue the radical path because of his very nature and his antagonism toward Johnson. The Northern military mind on the whole then, in spite of its several deviations, was fundamentally moderate in its approach to the Southern question.

Microfilm \$5.05; Xerox \$18.00. 396 pages.

HOME ECONOMICS

RELATIONSHIP OF POSTURE TO ENERGY EXPENDITURE AND OTHER PHYSIOLOGICAL RESPONSES OF WOMEN ASCENDING AND DESCENDING STAIRWAYS

(L. C. Card No. Mic 60-758)

Marjorie Branin Keiser, Ph.D.
The Ohio State University, 1959

Physiological costs of homemaking are relatively unknown. It is difficult for physicians to recommend the household activities in which physically limited homemakers can participate, as well as for women to evaluate techniques said to reduce the physiological cost of housework.

Principles of work simplification have been stressed in the past as the best method for the reduction of energy expenditure in household tasks. However, there have been indications that reduction of time and motion does not always mean less exertion. A new approach is possible if relationships can be established between newly developed methods of postural measurements and energy expenditure, pulse rate and/or pulse pressure.

The purposes of this study were (1) to determine whether an increase in postural measurements is accompanied by an increase in physiological responses, (2) to study the effect of change in stairway design on physiological costs, and (3) to gain additional information concerning techniques for future studies.

Pilot studies in which three women participated were used to determine the number of subjects, tests and trials required. Subjects between the ages of 25 and 35 years, of average weight and height, were selected to eliminate as many physical variations as possible and yet be representative of the homemakers most likely to use stairways in completion of household tasks.

Stairways were of three designs: (1) architecturally desirable, 7-inch riser, 11-inch tread, 33-degree pitch; (2) the mean of surveys conducted in the Ohio-Michigan area, 7-inch riser, 9-inch tread, 40-degree pitch; (3) and an acceptable basement or attic stair, 9-inch riser, 11-inch tread and 40-degree pitch.

Metabolic determinations were made of subjects in basal state, standing, walking and during activity of either ascending or descending stairways of various designs. The entire procedure, including breakfasts and rest periods, required approximately three and one-half hours and was repeated by each subject on two different days. Techniques for measuring postural changes established in a previous study by this writer, were used to determine angles of body bend, knee bend and reach.

Results of experiments with ten subjects showed that postural change is in direct relationship to energy expenditure. The establishment of this relationship offers a possible new technique to be used in the evaluation of work methods both at home and in industry. Motion picture analysis can predict increases and decreases in energy expenditure. No relationship was found between the extent of postural activity and/or pulse rate and pressure.

Energy costs as a result of performing the activity once and including time for pulse rate recovery were lower than when subjects reached a steady state. For ascending stairs the energy expenditure was approximately 1.616 calories per minute. Heart rate and pulse pressure increased approximately 12 and 18 per cent, respectively. Energy costs above walking for the descent of stairways was 33 per cent of that required for ascent. From a physiological point of view, no justification was found for stressing the necessity of a stairway having a 33 degree pitch over one of 40 degrees.

Microfilm \$2.50; Xerox \$8.20. 179 pages.

**A STUDY OF FACTORS INFLUENCING SELECTION
AND SATISFACTIONS IN USE OF MAJOR HOUSEHOLD
APPLIANCES AS INDICATED BY THREE SELECTED
GROUPS OF MARRIED WOMEN GRADUATES
OF THE OHIO STATE UNIVERSITY**

(L. C. Card No. Mic 60-789)

Eithel Bray Rose, Ph.D.
The Ohio State University, 1959

The purpose of this study was to identify problems in the selection, use and care of major household appliances and to determine whether college graduates who have had a basic course in household equipment select appliances on different bases and derive greater satisfactions in their use than do college graduates who have not had such a course. It was believed that such a study might point to implications for strengthening the teaching of household equipment programs.

The selected sample for survey included 755 women, graduates of the Ohio State University between the years of 1952 and 1959, and divided among three groups: (1) graduates of home economics; (2) graduates with other majors who had elected to take a basic household equipment course; (3) graduates with other majors who had not had a basic household equipment course.

About 66 per cent, or 495, of the sample answered a mailed survey schedule designed to ascertain family status, appliances owned, factors influencing appliance selection, and satisfactions or dissatisfactions derived from the use of appliances.

Over 33 per cent of all respondents were employed outside the home and over 48 per cent owned or were buying homes.

There were 335 children in the 495 homes; only 7 respondents reported as many as 4 children in the family. The number of children seemed to affect the number of purchased appliances in the home.

The respondents had purchased 2,520 appliances representing an investment of \$304,215. In addition, 2,262 appliances had been received as gifts. Analysis of factors was limited to the five major appliances; namely, range, refrigerator, washer, dryer, and vacuum cleaner.

The five most influencing factors in the purchase of

these major appliances as listed by the respondents were cost, brand or make, expected performance, used models, and quality. Pressure groups, such as relatives, friends and advertisers, exerted greater influence on homemakers not having had a basic household equipment course; this same group also tended to rely more upon consumers' magazines than did respondents who had taken a basic household equipment course.

Satisfactions were expressed by the majority of homemakers in the use of one or more of the five purchased major appliances. Satisfactory performance was predominantly outstanding, with special features or accessories, convenience in use, and ease of care following in importance. Factors such as color, quality, finish, model and guarantee ranked low in contributing to satisfaction.

The major cause for dissatisfaction with an appliance, as expressed by the homemakers, was unsatisfactory performance. Unsatisfactory features or accessories, inconvenience in use, difficulty in cleaning, incorrect size, and unsatisfactory service calls followed in that order.

Statistical treatment of data proved there was no significant relationship between the scholastic grade point-hour ratio and satisfactions or dissatisfactions derived from appliances by any of the three groups.

Respondents stated that in selecting replacements for present appliances greater automaticity and special features, especially in washers, refrigerators, and ranges, would be of most consideration, with more efficient models, better construction and design following.

In response to a question concerning the next appliance to be purchased and considerations to be made, the five previously mentioned major appliances predominated, but others were mentioned. Cost was the most influential factor determining choice of future appliances, with special features, good construction, efficient performance, convenience in use, and ease in cleaning as other factors for consideration.

The findings of this study pointed to specific problems for emphasis in basic household equipment courses at college level and emphasized the need for greater communication of consumer information to those who do not have the opportunity for formal training through extension, adult education, or other educational facilities.

Microfilm \$2.50; Xerox \$8.40. 185 pages.

LANGUAGE AND LITERATURE

LANGUAGE AND LITERATURE, GENERAL

A STUDY OF POINT OF VIEW IN THE NOVELS OF NATHANIEL HAWTHORNE

(L. C. Card No. Mic 60-419)

Allen Bales, Ph.D.
Northwestern University, 1959

This study is concerned with Hawthorne's use of point of view as it relates to the structure of his four major romances, The Scarlet Letter, The House of the Seven Gables, The Blithedale Romance, and The Marble Faun. The other aspects of Hawthorne's method (his use of the past, imagery, and symbolism) are considered only in so far as they reveal, or are tangent to, his use of point of view.

A cursory examination of Hawthorne's romances reveals that, by and large, he relied upon the omniscient author tradition to expose his stories to the reader. This tradition allowed him to stop the story action for the purpose of analyzing and commenting on the scene, the characters, their thoughts and actions, and the setting. Only once, in The Blithedale Romance, in which he used the first person, did he depart from this tradition.

The relationship between Hawthorne and the story, and between Hawthorne and the reader, varies from novel to novel. There are differences in the quantity and quality of the omniscience exercised. In The Scarlet Letter, for example, Hawthorne's relationship to the story is very largely defined by the close dramatic structure of the novel, and his commentary is organic in nature; his relationship to the reader is less obvious. On the other hand, in The Marble Faun, the opposite of this is true. Hawthorne, in The Scarlet Letter, achieved that "grace of intensity," which James thought so highly of, to a greater degree than he did in any of the other romances.

In order to determine Hawthorne's relationship to the novel certain questions were posed and the novels were analyzed in an attempt to discover the answers to the questions. The questions are: What role does the author play in the story? To what extent is the reader dependent upon the author for his knowledge of character and action? What is the author's relationship with his characters? Does he present them from an objective or subjective point of view? Does the author intrude upon the story in order to make comments on the characters and actions? If so, what is the nature of these comments: are they organic to the particularized life within the novel? do they advance or define the theme? are they tactfully made or do they destroy the fictional illusion? what do they do to reveal the controlling mind of the author?

By seeking the answers to these and other questions in the light of Hawthorne's intention it was found that Hawthorne discovered ways of rendering his stories in the most artistic manner that his talents could devise. The results of his efforts have placed him high among the great literary artists of this country.

One of the techniques that he used with great success was to create a set of symbols that permitted him to reveal many levels of the truth which he sought to portray without relying altogether upon the privileges of the omniscient author. Another was that he selected themes which ran through the center of his vision of life. Still another was that he created a small manageable cast of characters and placed them in a setting, removed from the highways of ordinary travel, in which they could act out their stories. But most important, he utilized a point of view which permitted him to bring symbol, image, theme, character, action and setting into an artistic whole. With the omniscient author as the primary tradition to start from, Hawthorne pushed this technique to its limits and experimented with another in an attempt to look beneath the surface and see the inmost soul of his characters and the lives that they lived in the world of romance that was uniquely his.

Microfilm \$2.70; Xerox \$9.45. 207 pages.

REPRESENTATIONS OF VENUS IN ITALIAN RENAISSANCE PAINTING AND ENGLISH RENAISSANCE POETRY

(L. C. Card No. Mic 60-58)

Eugene Benjamin Cantelupe, Ph.D.
Washington University, 1959

Chairman: Professor William A. Ringler

The purpose of this research was to determine the meanings of the various representations of Venus in Italian painting and English poetry of the Renaissance through analyzing the current of ideas and examining the iconography and techniques of two media, in order to determine the artists' and the poets' intentions in employing mythological figures and to establish certain relations between the visual and verbal arts.

The method of iconography was utilized because it has been eminently valuable in explicating the meaning of Renaissance painting. While literary and pictorial theorists of the period insist on the sisterhood of the two arts, rarely have modern students of Renaissance poetry availed themselves of that method which critics and historians have used so successfully to illuminate Renaissance pictures. In order to obtain more rigid control over the material, one mythological figure was selected for study. Venus was chosen because she is a major Olympian, a deity ubiquitous in art and literature, and a key figure in the representation of love—a theme which Renaissance artists emphasized, giving it usually mythological disguise. The dissertation presented a history of the appearances of and meanings attached to Venus in art and literature from antiquity through the Renaissance; in the context of this history, the motifs, attributes, stories, and allegories of the Italian paintings and English poems in which Venus

appears were defined and related to themes or concepts. For example, a recumbent Venus who watches over a disarmed, slumbering Mars, personifies the planetary deity whose grace and amiability neutralize the bellicose fervor of the planet Mars. The pictorial or poetical depiction of this astral myth is an allegory of Love vanquishing Strife.

Important results were achieved in interpreting the meanings of poems and paintings. Shakespeare's Venus and Adonis, long criticized for its discordant elements - English setting for mythological lovers, and comic tone, apparently inappropriate to the poet's serious intent - emerged, after the identification of "naturalistic" features like the hare and the boar as conventional components of the Adonis myth in verbal and graphic art, as an original Ovidian tragi-comedy, which illustrates Shakespeare's wrenching of the mythological tradition from its sixteenth-century mold. Analysis of the emblematic landscapes and different musical instruments illustrated in Titian's four paintings of Venus and a musician, a group of pictures grossly misinterpreted and rarely recognized as a series of variations on a set theme, revealed that the canvases present iconically the stages through which the senses participate in the cognition of beauty.

Many valuable and pertinent relations between Renaissance poetry and painting were established. For example, Botticelli's much disputed La Primavera is an allegory of the medieval doctrine of Naturae plenitudo, which Chaucer employs in the Parliament of Fowls and Spenser in two notable episodes of the Faerie Queene. Poets and philosophers of the school of Chartres derived it from the same Neoplatonic sources that Marsilio Ficino studied. Chaucer obtained it from Jean de Meun, Spenser from Chaucer and Ficino, and Botticelli from the Florentine Neoplatonists. Behind the doctrine of ut pictura poesis, to which all Renaissance movements subscribed, lies a struggle between poets and painters for social and intellectual prestige. The history of this doctrine should not be examined to determine the extent to which poets and painters influenced each other, but rather investigated within the context of manuals, compendia, and glossed classical texts which practitioners in both media consulted for ideas, subjects, and motifs. Renaissance poems and paintings have much in common not because their creators copied from each other but because they resorted to the same textual sources.

Microfilm \$5.60; Xerox \$19.80. 439 pages

PHILIP MASSINGER'S COMEDIES

(L. C. Card No. Mic 59-5545)

John Henry Crabtree, Jr., Ph.D.
The University of North Carolina, 1959

Supervisor: Robert B. Sharpe

Philip Massinger's comedies - A New Way to Pay Old Debts, The City Madam, The Great Duke of Florence, and The Guardian - are strongly didactic plays in which the playwright's technique was adapted to the moral purposefulness for which he designed them. The plot of each play develops a particular thesis. A New Way to Pay Old Debts illustrates the destructive force of wealth when it is abused. The City Madam dramatizes the same thesis with particu-

lar attention to the corrupting influence of vanity and ambition. The Great Duke of Florence teaches that deception brings misery, and The Guardian dramatizes Massinger's belief that chastity and marital fidelity furnish the only basis for happiness in love. In addition to designing his plots to illustrate particular moral lessons, Massinger composed dialogue which permitted his characters to discuss fully and vividly the view of life which their actions dramatized. He adapted his technique of characterization to the moral purposefulness of his plays, subordinating his characters not to plot but to didactic intention. The characters describe each other, discussing the virtues and vices which they represent and emphasizing the moral of the play. Each play also develops a number of secondary themes which further emphasize the didactic intention of the playwright. Massinger used his comedies to insist upon the necessity of maintaining existing class distinctions; to condemn gaming, lechery, and duelling; and to denounce ingratitude. He also expressed emphatic opinions concerning the education of princes and the character of a good king and faithful courtier.

In general, Massinger's comedies cannot be said strongly to reflect the tradition of the medieval Morality or the satirical comedy of Ben Jonson. Nor do the romantic comedies suggest the influence of Fletcher. In simplicity of plot and characterization, A New Way to Pay Old Debts resembles the Morality. It reflects Jonson's influence only slightly in its use of several minor characters who resemble "humour" characters. Its structure is unlike that generally associated with Jonson. It is not, however, a satire. The City Madam bears little resemblance to the Morality, but it strongly suggests the work of Jonson. Its structure is typically Jonsonian, and it employs the satirical method described in the "Induction" of Every Man out of His Humour. Luke's function as a scourge suggests Jonson's influence. The romantic comedies illustrate the same didactic purposefulness which characterizes the realistic comedies; though their settings, their ladies and gentlemen, their love intrigues suggest Fletcher's influence, the spirit of both of Massinger's plays is wholly unlike that which pervades Fletcher's comedies. Detailed comparative analyses of Massinger's comedies with plays by Middleton, Marlowe, Shakespeare, Heywood, Jonson, and Fletcher demonstrate that, though Massinger might have borrowed characters and situations from their plays or might have been inspired by them, he was an original playwright who used his materials in a characteristic manner. His indebtedness to Middleton's A Trick to Catch the Old One has been exaggerated, while the similarity of The City Madam to Measure for Measure has been generally ignored. His specific indebtedness in The City Madam to Jonson has been inferred but not described. The artistic unity of this play becomes apparent when the kinship of Luke to Angelo and Asper-Macilente is recognized.

Massinger's comedies are "exemplary" comedies, designed primarily to teach by dramatizing moral lessons. His plots, his dialogue, and his characters were employed to teach by examples that virtue will be rewarded and vice punished. His plays look backward to the Morality and forward to the comedies of Shadwell, Cibber, and others.

Microfilm \$4.05; Xerox \$14.20. 315 pages.

R. ABRAHAM BEN R. ISAAC HA-LEVI TaMaKH (7th):
TWO HITHERTO UNKNOWN MANUSCRIPTS OF HIS
COMMENTARY TO PROVERBS 31:10 TO END,
LAMENTATIONS 3:1-66, AND FRAGMENTS FROM
ESTHER, WITH ANNOTATIONS AND NOTES TO THE
TEXT AND AN INTRODUCTION ABOUT THE AUTHOR.

(L. C. Card No. Mic 60-485)

Leon Aryeh Feldman, D.H.L.
Yeshiva University, 1957

This volume presents two hitherto unknown manuscripts by R. Abraham ben Isaac Ha-Levi TaMaKH from the Geniza collection of A. S. Wertheimer of Jerusalem. In addition to the text and notes, a photographic reproduction of the original is provided.

The material comprises commentaries to Proverbs 31:10-End; Lamentations 3:1-66, and to fragments from Esther, representing a now unavailable commentary on the entire books.

The MSS is a copy by a 15th century scribe. The author lived during the latter half of the 14th century and died in 1393. He also wrote commentaries to Ecclesiastes, now lost, and Song of Songs, available in several MSS and in extremely rare printed versions, 1558 Sabionetta and 1611 Prague.

This dissertation clarifies many doubts as to his origin, residence, date of death, and reference to his name. R. Abraham was of Spanish origin, residing in Gerona until 1391. He fled and after considerable wandering, reached Jerusalem, which he abandoned to spend the rest of his life in Italy where he died in 1393.

The appellation TaMaKH means "Assistant to a Kohen" (a Levite) rather than "quiescat in honore."

R. Abraham appears to have been a member of the "circle of poets" in Gerona and Barcelona, and looked upon R. Nissim ben Reuben Gerondi as his teacher.

Microfilm \$2.95; Xerox \$10.35. 226 pages.

THE PRINCIPLE OF MULTIPLICITY IN HAWTHORNE'S FICTION

(L. C. Card No. Mic 59-5175)

James King Folsom, Ph.D.
Princeton University, 1959

This thesis is a discussion of the principle of multiplicity in Hawthorne's fiction, which attempts to show that Hawthorne uses this principle consciously for the artistic purpose of making his symbolic structure constantly more inclusive and more complex. Various aspects of the technique are analyzed to show some of the methods which Hawthorne uses to enhance the complexity of meaning in his tales. Hawthorne's attempt to combine opposite meanings into one or more symbols, his method of using comic means for serious ends, his techniques of opposing different points of view of a given fictional event, and other devices for adding greater symbolic meaning to a fictional happening are discussed at some length. In addition, the development of Hawthorne's fictional techniques is analyzed in terms of his growing skill in combining apparently contradictory meanings into apparently simple and straightforward symbols.

Since this thesis is directed primarily toward analyses of Hawthorne's artistic means, the meaning of Hawthorne's fiction, its ideological and philosophical content, is discussed only in passing. Hawthorne's methods of presenting the "meaning" of his tales is the subject of this study rather than an exposition of the enigmatic moral and religious significance of the tales themselves.

Microfilm \$3.60; Xerox \$12.20. 280 pages.

THE DRAMATIC CHORUS IN ENGLISH LITERARY THEORY AND PRACTICE

(L. C. Card No. Mic 60-14)

Ernest G. Griffin, Ph.D.
Columbia University, 1959

This study traces the history of the dramatic chorus in English literature, being concerned with other literatures only insofar as they affect the English. It is confined mainly to works in which the term "chorus" appears or is clearly appropriate, though some attention is given to choral equivalents.

Though rarely successful on the English stage, the "classical" dramatic chorus has frequently been the subject of critical debate and has been used in a distinguished tradition of closet drama for three centuries, a tradition which includes works by Daniel, Greville, Milton, Shelley, Swinburne, and Hardy. Poetic and philosophic playwrights have used the chorus to provide moral, rhetorical, interpretative, lyrical, symbolic, or spectacular comments on the action. To generalize on its function is difficult. Perhaps the most useful general comment was made by Milton's nephew, Edward Phillips, who saw the distinction between action and chorus as that between pathos (broadly, the transient and emotional) and ethos (the permanent and ideal).

A summary by chapter follows:

Chapter I, The Elizabethan Chorus. The English medieval theatre had some choral elements resembling those in classical drama. In the Renaissance, humanists favored the Senecan chorus over the Greek, a fact reflected in the early English classical tragedies. Especially interesting is *Gismond of Salerne in Love*, in which the chorus represents the ethos of the restraining monastic and chivalric codes in opposition to the passionate romanticism of the main characters. Only vestiges of the chorus remain in popular plays by Kyd, Shakespeare, Jonson and others.

Chapter II, The Puritan Chorus. Influenced by the French Senecan Garnier, the elite Pembroke Group produced a number of choral dramas. Transcending the Senecan influence, Greville's choruses gave a Puritan moral commentary on historical events. The influence of Paraeus, an ethical view of music, and a profound understanding of the Greek chorus helped Milton create the *Samson Agonistes* choruses.

Chapter III, The Neoclassic Chorus (I). Dryden and other Restoration playwrights found the chorus an impediment in the reopened theatres, although the operatic chorus,

encouraged by Davenant, became popular. Whether or not the classic chorus was essential to great drama became the chief point of debate between Thomas Rymer and John Dennis. The argument was continued by Gildon, Ralph, Collier, and others.

Chapter IV, The Neoclassic Chorus (II). William Mason revived the classical form of chorus in the sentimental *Elfrida* and "heroic" *Caractacus*, thereby causing a conflict of views among such critics as Gray, Hurd, Joseph Warton and Fielding. Later, increasing attention was paid to the melic element, Kames approving incidental music as a means of replacing the chorus. Shakespeare was frequently cited, Maurice Morgann asserting that his genius required a wider compass than "the narrow circle of the Chorus."

Chapter V, The Romantic Chorus. Coleridge and other English Romantic critics frequently echoed German Views on the chorus, especially A. W. Schlegel's "ideal spectator" theory. De Quincey introduced the useful concept of "the ethico-physical sublime," which can be applied to Byron's and Shelley's choral dramas. Outstanding are the choruses in *Manfred*, expressing a psychological tension between the subjective and objective, and in *Prometheus Unbound*, introducing a new and brilliant form of dramatic lyricism.

Chapter VI, The Victorian Chorus. Instead of lyrical power, Arnold emphasized classical form, producing the unexciting *Merope*. In *Atalanta in Calydon* and *Erechtheus* Swinburne concentrated on the lyrical, though at the expense of the dramatic ("ripeness of meaning" was in the "music"). In *The Dynasts* Hardy, returning in part to an older rhetorical tradition, used the chorus to express the relation of history to "the Will." The epilogue deals briefly with the choruses in T. S. Eliot's plays and with other recent developments in choral drama.

Microfilm \$2.95; Xerox \$10.35. 228 pages.

JOHANN ULRICH ERHARD:
WÜRTTEMBERG'S "SMALLEST NIGHTINGALE".

(L. C. Card No. Mic 60-289)

Robert Ludwig Hiller, Ph.D.
Cornell University, 1959

This work attempts to explain why Johann Ulrich Erhard (1647-1718), court poet and professor *poeseos* at the *Gymnasium* in Stuttgart, succeeded in winning, during his lifetime, a degree of literary fame which seems unwarranted in view of his small talents. This parallels the question of why Württemberg, the cradle of great poets, after the Thirty Years' War and almost until the first half of the eighteenth century had hardly any influence in the development of German literature.

The first part of this study deals with the Duchy of Württemberg, its constitution and its peculiar socio-political structure, in which the clergy and the peasant and middle-class, but not the nobility, were the only two constitutional estates. As a Lutheran minister, Johann Ulrich Erhard thus was a member of a powerful political class which was the sole guardian and dispenser of culture and education in the Duchy. This predominantly clerical in-

fluence was a limiting one upon poetic production, calling forth chiefly works of a purely religious nature.

The rising tide of Absolutism and the Court's predilection for all things French and its consequent lack of interest in literature in German, further served to stifle the emergence of any literature other than that of a religious nature in Württemberg.

The second part of the thesis shows that Johann Ulrich Erhard's poetry is a reflection of this situation. In his early poetry in Latin, speaking as a Lutheran theologian, he refutes Catholic, and particularly Jesuit, literature. His occasional poetry in German, which was never published, suffers from a provincialism imposed, on one hand, by the Court's lack of interest in poetry in German and in the literary production outside of Württemberg, and, on the other hand, by the disapproval of the literarily limited clergy.

The final section is concerned with Erhard's main work, *Himmlische Nachtigall*, a private hymnal, which is a prime example of the sort of literature approved by Württemberg's clerically dominated and educated middle-class intelligentsia. The *Himmlische Nachtigall*, however, also is an early attempt to bring descriptions of nature, which, although still very embryonic, foreshadow the realistic nature description of Brockes (1680-1747). As a religious work, this hymnal still shows the concern of Württemberg in the early seventeenth century with Catholic literature and also the influence of the Pietist movement of the last half of the century.

Thus, Johann Ulrich Erhard's poetry mirrors the political, cultural and religious crosscurrents in Württemberg, and helps to explain why Württemberg's literary role was such a minute one at this period.

Microfilm \$2.50; Xerox \$7.20. 152 pages.

RESTLESS HEIR:
THE BOY IN AMERICAN FICTION.

(L. C. Card No. Mic 60-30)

John Peter Hinz, Ph.D.
Columbia University, 1959

An attempt at cultural definition and literary appraisal rather than a comprehensive survey, this study seeks to retrace that growth of sensibility which culminated in *The Adventures of Huckleberry Finn*.

No other literature has represented the boy, especially the "bad" boy, so often or so sympathetically: few themes are more congenial to the American imagination. However amiable and timely, *The Story of a Bad Boy*, which established the genre in 1870, was scarcely the beginning. An untidy social fact before he ever became a literary subject, the boy has exercised theologians and reformers from Plato to John Dewey. He still remains civilization's perennial test of survival and continuity; his status reflects in miniature the larger condition of man.

The English boy had a bewilderingly long way to travel before his arrival as a literary theme. The gradual shift from books intended to instruct young readers to those designed to give them pleasure is one measure of his changing fortunes; the reluctant admission of fable and

folktale into the nursery is another. His progress may be more directly traced through the course of English poetry (Shakespeare uses children and Milton ignores them; they are auguries of innocence to Blake and the unfolding adult consciousness to Wordsworth) to his eventual prominence in Dickens' prose. It is this later, heightened awareness of children, of their human and literary potential, into which Thomas Hughes launched Tom Brown's Schooldays with spectacular effect.

The American boy reflects in turn the national experience and consciousness in which he is imbedded. Puritan piety, conformity and, later, industry and thrift had stern implications for New England boys. Conditions of frontier life and the egalitarian influence of democratic ideas, on the other hand, made for casual manners and relaxed authority. Set against the moral chaos of the Gilded Age, finally, boyhood took on a new and mythic significance.

Hawthorne alone among New England authors made significant use of children, but they generally are more emblematic than real. There are occasional ingratiating glimpses of boyhood in novels of ante-bellum plantation life, and in their early ventures the rascally heroes of Southern humorists sometimes foreshadow the "bad" boys to come. Davy Crockett's "autobiography" pioneered the Western vernacular, and Eggleston's The Hoosier Schoolmaster established the required homely setting. Combining these diverse elements, shrewdly written for young and old alike, the climactic book of boy-life is The Adventures of Tom Sawyer.

Like Don Quixote, but more subtle in characterization and carefully plotted, The Adventures of Huckleberry Finn escapes the boy mold entirely. With his transcendent eye and "understanding heart" its hero is one of the freest, most solitary and complex figures in literature. Of extraordinary range and sensitivity, its style spans the gap from dialect to dialectic. For with its dialogue form and steady confrontation of idea and reality (in which Huck, not Jim, is emancipated) The Adventures of Huckleberry Finn is a philosophical novel, Twain's masterpiece, and one of the great books of the world.

After it, everything else had to be anticlimactic. Howells and Garland continued to depict boyhood's minor realisms; James and Crane artfully caught its lonely terror. But the popular image of boyhood grew faint and sentimental. Sex-tormented adolescents displace the boy in the writings of Dreiser, Anderson, and Fitzgerald; only Hemingway's "Nick" and Faulkner's "Ike" retain their affinity with Huck. The "bad" boy and his literary counterpart now are proscribed alike: only "problem" children in need of "adjustment" remain. But surely an "adjusted" boy is a contradiction in terms.

Microfilm \$3.50; Xerox \$12.15. 270 pages.

DREAM VISION IN THE POETRY OF KEATS

(L. C. Card No. Mic 60-360)

Charlotte Wood Schrader Hooker, Ph.D.
Tulane University, 1959

Chairman: Richard H. Fogle

Keats based his poetry upon his belief that "What the imagination seizes as Beauty must be truth." The imagi-

nation is an intuitive power as opposed to logic or reason. It is associated with semi-conscious or unconscious thought, such as the waking visions of trance, daydreams, or dreams of sleep. Various kinds of dream visions, both of waking and of sleep, record Keats's regular steppings of the imagination towards truth. His poetic career was devoted to developing this imaginative power, both through philosophical wisdom and intense sensory experience, so that his dream visions, the products of imaginative insight, would progress ever closer towards the highest realities.

Keats's 1817 Poems resulted mostly from the bardic trance, in which his mind received its inspiration from natural beauty, and created poetry from the association of images. In Endymion he tried to clarify the imaginative processes by experimenting with all manner of dreams, waking visions, and dreams-within-dreams. Through the myth of Endymion's love-dreams of the moon goddess and of his awakening to find his dreams true, Keats symbolized the ability of the imagination to achieve a fellowship with essence through a love of beauty.

By 1818, however, the world's miseries began troubling his mind so that his dreams of beauty turned to nightmarish visions of pain, as in his Epistle to Reynolds. He began seeking a way to reconcile pleasure with pain, since he realized now that an acceptance of pain was necessary for understanding truth. Hyperion provided the answer when it showed Keats renouncing Saturnian innocence and bliss for Apollonian "knowledge enormous," which could "envisage circumstance, all calm." Apollo, the god of poetry, received his creative powers through his dreams of Mnemosyne. Keats likewise trusted his dreams--his imaginative insights--to make him a poet by helping him see the world wholly and truly, as Apollo did. This meant accepting the world as a Vale of Soul-Making, where joy and sorrow both are necessary to school the mind and heart until they become a soul, an identity.

In a group of poems about women and love, Keats experimented with several types of dream visions. The Eve of St. Agnes showed the power of ecstatic love-dreams to immortalize the lovers, Madeline and Porphyro. But the knight-at-arms of "La Belle Dame Sans Merci" and Lycius in Lamia were doomed respectively to everlasting disillusionment and to death for trusting in false dreams of a Fatal Woman.

Keats's highest achievements were the 1819 Odes, which grew from a rich complexity of idealistic visions and realistic waking thought. The Psyche and Indolence Odes show the imagination envisioning beauty with relaxed creativity. The Nightingale Ode describes the poet's ecstatic joy in nature's beauty as well as his anguish at seeing the brevity with which man can experience such beauty and happiness. The "Ode on Melancholy" declares that man must accept the inseparability of melancholy and beauty in this life. If he does, he will see life wholly and truly, as the poet envisions it in comparison with art and nature in the "Ode on a Grecian Urn" and "To Autumn."

Through his dream visions Keats had learned to see the world as a god sees it, in the wholeness of its truth and beauty. Yet he felt that to be a genuine poet he must do more than envision truth and beauty; he must also do some active good for the world. The Fall of Hyperion records this vexation. We may conclude, though, that Keats had already benefited the world through his poetry. What his imagination seized as beauty was truth.

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SPENSER AND THE EMBLEM BOOKS

(L. C. Card No. Mic 60-668)

Jack Willard Jessee, Ph.D.
University of Kentucky, 1955

Supervisor: Dr. Thomas B. Stroup

This dissertation is an effort to determine the extent and nature of emblematic influence upon Spenser's poetry. Previous studies of the problem have emphasized the emblem books as source material for his imagery, but this study is primarily concerned with Spenser's adaptations of the emblematic technique.

The plan of the dissertation is simple. Chapter One reviews some of the antecedents of emblem literature. The excellent general discussions by Green, Volkmann, Thompson, Praz, and Freeman, to name only a few, have obviated the necessity of any detailed treatment of the history and the popularity of the emblem books of the Renaissance. Some of these studies are reviewed, however, with the intention of emphasizing the moral nature of the emblem, a feature which sixteenth- and seventeenth-century commentators also emphasize. The precursors of emblem literature are also described in order that the relationship between the moralized similitudes of the emblem books and those of early illustrated books can be clearly delineated. This factor has been ignored in more recent studies, and there is, of course, an obvious connection with Spenser's allegory.

Chapter Two considers the emblematic practice in England prior to and contemporary with Spenser's time. Because scholars since Green tend to assume a later development of the emblem movement in England than the facts seem to warrant, the emblematic features of early illustrated books in English are described, and evidence is cited to demonstrate that England's interest in the emblematic traditions paralleled the development of that interest on the continent.

The remaining chapters illustrate Spenser's adaptations of various emblematic techniques in his *Shepheardes Calendar*, in the development of his sonnet-form, and in the creation of the pageants and allegorical characters of *The Faerie Queene*. Spenser combined the emblem with the pastoral and the almanac to form a unique literary composition in the *Shepheardes Calendar*; he combined the emblem with the vision to produce a distinctive sonnet-form which is perhaps best exemplified in the *Amoretti*. The emblem also contributed to Spenser's pageantry. The personified abstractions are touched with life and color, lending symbolic meaning to the "continuing allegory." Likewise the flesh-and-blood characters are given symbolic significance by means of emblematic attributes.

Spenser made use of emblem literature throughout his writing career: the emblems supplied source material for his images, a teleological design for his sonnets, a unique framework for his *Shepheardes Calendar*, convenient symbols for his allegory, and a common denominator for his readers. But in using the emblem, Spenser placed his own stamp upon it. His originality stems, not from his invention of new forms, but from an eclectic combination of many forms. The emblem never appears as an emblem alone in Spenser's poetry; it invariably combines with other standard and approved forms to make something entirely different and new. The unerring selection of those

features of the emblem book which served his purpose best, that hypersensitive selectivity which he practiced in the adaptation of other forms is perhaps the most important element of his artistry.

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CHAUCER AND THE TRADITION OF FAME:
A STUDY OF THE SYMBOLISM IN
THE HOUSE OF FAME.

(L. C. Card No. Mic 59-5194)

Benjamin G. Koonce, Jr., Ph.D.
Princeton University, 1959

The aim of this study is to provide a traditional medieval context for *The House of Fame* which will clarify its purpose and thereby reveal its thematic and structural unity. This task involves the study of two closely related aspects of the poem: its subject matter and its poetic method. Since the medieval attitude toward fame has doctrinal ramifications of which the modern reader may not be aware, Chapter I attempts to supply those basic assumptions about fame which are necessary in understanding Chaucer's exploration of his theme. The essential meaning is a Scriptural contrast between two kinds of fame, heavenly and earthly--a contrast elaborated by Augustine and later writers of the Middle Ages. Augustine's treatment of fame underlies that of Boethius, whose *De consolacione philosophiae* informs the medieval literary treatments of the subject. Since Chaucer's fickle goddess has recognizable affinities with Boethius' Fortune, Chapter I concludes by considering the process which transformed Fame from her pagan prototype into a symbol utilizable by a Christian poet.

Chapter II examines the poetic method by which Chaucer created a unified structure for exploring the Christian doctrine of fame. The unity of the poem, it aims to show, is an inner unity, one which, in accordance with the traditional methods and objectives of poetic allegory, is often obscured on the surface by a fictive veil of symbols. More specifically, its form is shown to be that of the prophetic vision--a genre based upon Scriptural prototypes and having as its purpose the inculcation of wisdom in symbols requiring interpretation. Within this allegorical framework, Chaucer has developed his theme, the vanity of earthly fame; but in order to point up the contrast between heavenly and earthly fame he has created a complex allegorical machinery whose component symbols are referable to Scripture and to Christian doctrine and are at the same time harmonious with the intellectual preoccupations of his time. Chaucer's method may be called one of symbolic inversion, since it suggests the traditional technique of Scriptural exegesis whereby a symbol may connote two opposite meanings. By using such ambivalent symbols, Chaucer is able not only to explore the nature of earthly fame but also to point up the anagogical aspects of his theme. On the basis of this higher aim, Chapter II suggests an inner correspondence between *The House of Fame* and *The Divine Comedy* which helps to explain Chaucer's borrowings from Dante.

A consideration of Chaucer's theme and method provides the basis for a detailed analysis of the poem in the

remaining three chapters. This analysis demonstrates that the three books of The House of Fame form a whole, in spite of the incomplete, or apparently incomplete, character of the last book.

Microfilm \$5.80; Xerox \$20.50. 454 pages.

THE WAYFARING LIFE IN
EIGHTEENTH-CENTURY ENGLISH LITERATURE

(L. C. Card No. Mic 60-672)

Barbara Jeanne Payne Lafferty, Ph.D.
University of Kentucky, 1953

Supervisor: Arthur L. Cooke

The Wayfaring Life in Eighteenth-Century English Literature is an investigation of the use of land travel in English literature of the eighteenth century. More explicitly, the aims were to determine the degree of authenticity of travel accounts in that literature, to note what particular aspects of travel received most attention, and to observe the extent to which the literature was enhanced artistically by utilization of materials taken from actual travel by land.

As a result of this investigation, certain rather specific conclusions have emerged. Among the novelists, who—with the exception of the journalists—made the most extensive use of road life, Henry Fielding and Tobias Smollett utilized wayfaring most effectively and most realistically. Their treatments were facilitated by first-hand knowledge of the subject. Fielding's, however, are characterized by robustious good humor, whereas Smollett's usually involve a harsher realism. In marked contrast to these two is Daniel Defoe, who actually cared little for details of wayfaring in writing his novels, and preferred to concentrate on sea travel; even in his Tour, his interest centered on economic conditions, rather than on road life for its own sake. Laurence Sterne's method of handling the Grand Tour was that of the whimsical satirist, whose travel experiences were transformed—sometimes unrecognizably so—into sentimentality-ad-absurdum. Minor novelists, for the most part, were lacking in originality and spirit when they wrote about wayfaring. Of the other genres discussed, the essay devotes perhaps least space to life on the road, since the subject could not add a great deal to the type of thematic exposition developed by the essayists: a few writers drew morals from travel, some described a scene or episode. Letter writers, however, were frequently moved to pen informed and readable epistles relating their experiences on the road, either abroad or in England. A considerable amount of poetry and drama—surely more than one might expect to find—attests the influence of travel, though the subject was of small service to the literature of higher seriousness; especially during the latter part of the century, more and more serious descriptive material crept into the poetry, and minor details of journeys were ignored. The majority of travel accounts proper deserve the neglect which has been their portion: however, a few highly literary records (notably those of Addison, Fielding, Smollett, Boswell, Johnson, and Beckford) justify more critical attention than they have usually received.

Certain other generalizations are suggested by this survey. The eighteenth century had too often been described as a hypersensitive, excessively refined age, yet travel—with its rowdy adventures—was certainly as genuine a feature of the Augustan mode as the elegant assembly. The pervasive influence of the subject is revealed primarily in literature which is comic or realistic, not in works having didactic or moralistic purposes. One concludes that the subject of wayfaring, in various ways, contributed not a little to the artistic enhancement of eighteenth-century English literature.

Microfilm \$4.65; Xerox \$16.45. 361 pages.

A LITERARY ANALYSIS OF THOMAS HOBBS'
LEVIATHAN

(L. C. Card No. Mic 60-350)

Louis Francis May, Jr., Ph.D.
St. Louis University, 1959

Although considerable scholarship has been devoted to Thomas Hobbes' Leviathan, its literary artistry remains largely unexplored. The present study provides a literary analysis of Hobbes' masterpiece, with concentration on the tone, rhetorical figures, and structural qualities of his prose. This analysis shows that his world view conditions his understanding of the nature of philosophical prose. Examination of his world view helps explain his confidence, attitude toward figurative language, use of figurative language, and other aspects of his prose. Hobbes is thus a literary artist as well as a philosopher: his figurative language and other characteristics of his style stem from a number of assumptions about the nature and use of language, logic, and rhetoric, all integral to the expression of his philosophy.

This study fixes Hobbes' sense of philosophical decorum, his theory and practice with regard to the relation between logic and rhetoric in philosophy. For Hobbes rhetoric has no significant role in serious thought. However, a noteworthy disparity exists between his theory and practice, for he uses figurative language to explain his philosophy, thus violating his own rule of decorum. On the other hand, his prose reflects some of the procedures of logic.

The first chapter investigates his philosophy to offer some explanation of the dogmatic and self-confident tone of the Leviathan. This assertive tone can be partially accounted for by three aspects of this confident philosophy: (1) Hobbes' notion of and use of "method"; (2) a schematic model about body and motion representing thinking activities; (3) "political making." Belief in an infallible, unique method of invention and discovery is closely allied to renaissance rhetoric, logic and pedagogy. A total and self-contained system of mechanistic and skeptical philosophy shrinks the area of the knowable real, but supposedly enables man to have complete mental domination over this highly reduced residue of experience. This domination can be extended into the practical order by means of the Leviathan, a blueprint for shaping and controlling the state.

The second chapter examines some linguistic assumptions underlying Hobbes' attack on rhetorical figures,

scholasticism and eloquence. His philosophical decorum reveals a contradiction, for he equates figurative language with nonsense, yet uses several hundred tropes in his own masterpiece.

In the third chapter these rhetorical figures are examined to show how they explain or contradict the cognitive content of Hobbes' philosophy. His figures draw upon terms from these areas of experience: (1) the human body and the medical arts; (2) mechanisms; (3) religion; (4) folklore and superstitions; (5) scholastic philosophy; (6) games; (7) the fine arts; (8) the animal world; (9) warfare; (10) relationships; (11) sight; (12) mathematics; (13) the social scene; (14) the classics; (15) vegetation; (16) the physics of the mind.

The fourth chapter examines the structural qualities of the prose in the *Leviathan*. Working within the Renaissance tradition of the essay style, Hobbes contributed to the formation of "plain" prose. Characteristics of the essay style and Hobbes' development beyond it are first described. Next, his stylistic ideals are examined. Then, passages from the *Leviathan* are analyzed for formal characteristics of the essay style. Finally, Hobbes' prose achievement, dependent upon logic, is discussed to show that his style is a contribution to English prose.

Microfilm \$3.50; Xerox \$12.40. 272 pages.

THE THEME OF FAMILY DISASTER IN THE TRAGEDIES OF EURIPIDES AND SHAKESPEARE

(L. C. Card No. Mic 59-6398)

Gilbert Stuart Moore, Ph.D.

University of Southern California, 1959

Chairman: Professor O'Neil

Aristotle's formula for tragedy emphasized the use of dramatic situations and action that represent family disaster. In his judgment Euripides was the most effective playwright in producing tragic effect because of a consistent choice of stories involving the disasters of certain famous families. The university scholars of Renaissance England accepted Euripides as the exemplification of Aristotelian precepts. In writing original tragedies in Greek and Latin, Buchanan, Watson, and Christopherson chose Biblical subjects that presented family situations similar to those treated by Euripides. Euripides' *Iphigeneia in Aulis* served as a model for more than one treatment of the Jephthah story. Euripides was recognized by Ascham, Sidney, and Heywood in critical comments on the moral values of drama. There is evidence that Euripides was known to Shakespeare, particularly from the attention given to Euripides by Plutarch in his *Lives and Morals*. The incident noted in Plutarch's "Life of Pelopidas" which describes the effect of the calamity of Hecuba upon the tyrant of Thessaly may have been a source of Hamlet's mousetrap. The passage in North's translation specifically refers to the power of Euripides' *Troades*.

Aside from the probability of literary influence, however, a comparative study of the Greek treatment of family disaster and the Shakespearean development reveals the potentialities of this theme for dramatic effectiveness. For both tragedians pathos was centered in the relation-

ships of family members. The Greek concern for family continuity is paralleled in Shakespeare's consistent use of stories that depict the destruction of an entire family and the extermination of a lineage. The moral sense of both Euripides and Shakespeare develops from a concern for family integrity and survival. Realism is gained by both dramatists from the psychological accuracy of motivations involved in family roles. The tragic sense of frustration is not limited to the defeat of the hero on a purely individual basis but is expanded—as illustrated by Andromache and Hercules, Macbeth and Hamlet—to include the obliteration of an entire line of descent. The significance of aristocratic personages in tragic roles taken in this light contrasts strongly with the medieval concept of tragedy as involving the fall of a great man. Concern for family is an attribute of aristocracy. Through the use of stories involving the disasters of noble houses the tragedian presents a convincing portrayal of the fear of extinction that passes beyond the threat to the fortunes of the individual. Mortality, a major concern of all tragedy, is thus magnified. External evidence demonstrates that Greek life was impregnated with the fear of childlessness. Shakespeare's obsession with genealogy suggests that such a concept of mortality was the psychological background for his tragic feeling. The universality of the tragic appeal of Euripides and Shakespeare rests in large measure upon the treatment given by each to the theme of family disaster.

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TOWARD MOBY-DICK: MELVILLE AND SOME BAROQUE WORTHIES.

(L. C. Card No. Mic 60-794)

Robert Philip Shulman, Ph.D.

The Ohio State University, 1959

Melville read Rabelais, Plutarch, Montaigne, Browne, and Fuller (the first three in seventeenth-century translations). That reading helped him grow as an artist, and it made a crucial difference in the style of the books he wrote, particularly in *Moby-Dick*. I have used Melville's reading in these five writers of "the baroque" and "the anatomy" to help me focus on some aspects of the style--and thus the meaning--of *Moby-Dick*. My method is to discuss stylistic resemblances, from the most particular verbal echoes to the most inclusive organizing patterns. I sometimes place these internal relations in the larger cultural context which helped give them meaning and vitality.

One of the stylistic patterns in *Moby-Dick* can be called Rabelaisian. Melville's active response to the symbolic techniques and the cutting, irreverent moral and religious satire of *Gargantua and Pantagruel* helped him create an authentically Rabelaisian style. Melville frequently uses that style to lightly or sharply satirize the orthodox values of a group of his literary acquaintances, "the New York Rabelaisians." At issue is the basically genteel, common-sense approach to literature and religion which they--and most of Melville's public--favored. Their writing and values define a "social" Rabelaisian style. Stubb, the second mate, is conceived within a Rabelaisian context. He can be more fully understood than he has been if both the authentically literary and the derivative but contrasting social versions of Rabelais are kept in mind.

Rabelais (and Sterne), moreover, contributed to the recurring phallicism of *Moby-Dick*. Whether it is high-spirited or sublimely heroic, the sexual imagery in *Moby-Dick* typically conveys a sense of defiance and power. One dominant emphasis is on Ishmael's hostility to the norms of the respectable community and his simultaneous commitment to the potency of an integral, creative, unassimilated self. Another version stresses the White Whale's primal, defiant destructive force, a force which is not blind or indifferent but rather actively malicious.

The sharks and the sea are similarly destructive. Plutarch associates the sea and its creatures with the damned, the diabolical, and the brutally sensual: "Brit," "Stubb's Supper," and "The Shark Massacre" are some consequences. Plutarch's moral position and the quality of his language helped pervasively to make the latter two chapters possible--and powerful. He is also relevant to the theme of cannibalism and that of the civilized and the savage. I survey the latter idea as it figures in *Moby-Dick* and in the history of American thought.

Thomas Fuller's *Holy State* provided an important basis for the account of Queequeg's relation to Ishmael. His "The Good Soldier," moreover, contains an outline for the character and moral dilemmas which Melville finally dramatized in Starbuck. Fuller's weaknesses--Melville was aware of them--are also reflected in Starbuck. On the basis of my findings in Rabelais, Plutarch, and Fuller, I reverse the conventional evaluation of Stubb and Starbuck.

Even more than Rabelais and Burton, Sir Thomas Browne's *Vulgar Errors* and *Religio Medici* suggested a way of making fact and science merge into poetry and symbolism. Although Melville has Ishmael pervasively use Browne's style, he also characteristically reverses Browne's emphasis on love and puts that style to uses the direct opposite of Browne's untortured acceptance of the beauty and inscrutability of God and His universe. Ishmael, then, is typically made to speak in accents that have been conditioned by Browne, Montaigne, and writers like them. The baroque and the anatomy, that is, are basic to the style of Melville's narrator. One consequence of my study is to stress Ishmael's central role in *Moby-Dick*. Montaigne, Browne, and others intensified Melville's problems by demonstrating the feebleness of human reason and, in Montaigne's case, by making the existence of God distressingly uncertain. But equally important, these writers of the baroque and the anatomy also helped create the style which allows Ishmael to precariously and heroically endure his perplexities. I define that style in some detail. In the process, I discuss the continuity of *Moby-Dick*, its method of "careful disorderliness," and the kind of formal unity it shares with its predecessors.

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THE RESTORATION HEROIC PLAY

(L. C. Card No. Mic 60-46)

Edward Spingarn, Ph.D.

Columbia University, 1959

A small number of works written during the Restoration were known as heroic plays. Written in end-stopped iambic pentameter couplets, these plays were intended to

arouse admiration in their spectators and perhaps to provide escape from reality through their exaggeration. The earliest heroic plays gave rise to many imitations, and later works reveal few changes in the pattern. But although the conventions of heroic drama are in general familiar, they have not hitherto been exhaustively studied.

Parallels and analogues to many of the elements of heroic drama are found in other literary forms, both English and continental, but no single undoubted source can be determined. Even the technique of writing plays in rhyme cannot be traced to a definite origin, nor can the abrupt cessation of heroic drama be satisfactorily explained.

A number of plays that appeared during the period of heroic drama are written partly in heroic verse. Significantly, the rhymed passages in these works are used for discussions of love, for disquisitions on abstract subjects, for summations of plot dilemmas, and for debates. These elements assume major importance in the wholly rhymed heroic plays.

Dryden commented on the suitability of rhyme for "argumentation and discourse" and praised Orrery's heroic plays for their logical sequence of action. The result of the stress given to these elements by Orrery, Dryden, and their followers is an emphasis upon rhymed speeches in which the characters examine their motives at length. Rhyme was felt to lend itself particularly to tirades of self-examination. Stage situations were concocted in which subject matter of this sort could be included. In turn, plots and characters which provided for a maximum number of such situations evolved. The result was the heroic play.

How the ultra-romantic heroic play managed to exist side by side with Restoration comedy is not clear, although there are more similarities between these seemingly antithetical forms than is immediately apparent. Perhaps the flagrant unreality of heroic drama was an attempt at an exaggerated romance counterbalance to the cynically realistic comedy.

In heroic plays stock characters habitually express the reasons for their behavior, which they often conceive of as motivated by certain abstract forces which cause movement toward specific, though often intangible, goals. The main plots of these plays deal usually with the efforts of the hero and the heroine to be married in spite of obligations which they are unable to ignore or violate. Happy endings occur when duty, friendship, honor, glory, and reason cease to oppose love; unhappy endings ensue when they do not.

The abstract impediments to love are usually represented by a character to whom they are owed. Often the death of this character, which is also caused by abstract forces, ends the conflict. All the major types of characters--persons in authority, Machiavellian villains, heroes, and heroines--are likely to be motivated by love, most of them are motivated by egotism, all good characters are motivated by ethical principles, and only a few are motivated by a desire to live.

Heroic drama contains a high percentage of abstract words and many aphorisms. Soliloquies and debates are common, as are ranting speeches. Although adherence to the neo-classical rules is casual, heroic plays are uniformly serious in intention, include few episodes, and usually arrive at neat solutions. The sentiments that are expressed in the dialogue are often contradictory, but

praise of love, honor, duty, friendship, glory, and absolute monarchy are common themes.

Microfilm \$3.95; Xerox \$13.95. 308 pages.

LANGUAGE AND LITERATURE, CLASSICAL

A STUDY OF EIGHTEEN MANUSCRIPTS OF DARES PHRYGIUS

(L. C. Card No. Mic 60-327)

Humphrey James Courtney, Ph.D.
St. Louis University, 1959

The spurious *Daretis Phrygii De Excidio Troiae Historia* has up to this time appeared in only one critical edition, prepared by Ferdinand Meister and published at Leipzig, 1873. Of the manuscripts he used he distinguished two quasi-families, one *integriores*, the other *corrupti*. In 1955 the present author studied the codex Vat. Lat. 504 and discovered what gave evidence of an alternate recension.

The purpose of this dissertation is to provide a detailed study of all the known Vatican manuscripts plus six others in order to establish a family relationship among them, to list their variant readings, to determine whether they form a basis for modifying the *textus receptus*, and to seek further evidence of an alternate recension. The eighteen manuscripts studied are: from the Vatican library: Reg. Lat. 905 (saec. XII) (C), 946 (saec. XIV) (E), 1847 (saec. XV) (e), 657 (saec. XIII); Vat. Lat. 1795 (saec. XII) (c), 3339 (saec. XIII) (J), 3683 (saec. XVI) (X), 5261 (saec. XVI) (w), 2906 (saec. XV), 5622 (saec. XV); Ottob. Lat. 1808 (saec. XIII) (Z); Borg. Lat. 413 (saec. XV) (W); from the Bibliotheque Nationale: Charleville 275 (saec. XIII) (N); Douai 880 (saec. XII) (O), 882 (saec. XII) (S), 796 (saec. XV); from Trinity College, Dublin: Trinity 515 (saec. XIII) (T), 514 (saec. XIV) (Y).

Vat. Lat. 2906, and Douai 796, were found to be too corrupt for their collation to be worthwhile. Reg. Lat. 657, and Vat. Lat. 5622, were found to belong to the alternate recension with Vat. Lat. 504. Accordingly they are not collated in the dissertation.

A comparison of the variant readings in the remaining fourteen manuscripts discloses that they fall into two families: family alpha comprising CcYWw and family beta comprising EeNTZJXOS. Family alpha, in turn, falls into two sub-families: Cc and YWw; family beta into two: EeNTZ and JXOS.

Family beta departs from the *textus receptus* with much greater frequency than family alpha and when it does it is usually in agreement with Meister's G, which represents the corrupt tradition. Family Alpha follows the *textus receptus* more faithfully and thereby belongs to the better tradition represented by Meister's basic manuscript, Paris 7906 (saec. IX).

Because Meister based his readings on P almost exclusively the present author believes that an agreement between alpha and beta serves as a basis for correcting the text either on the grounds of an omission or an inter-

polation in P. Thirty-seven modifications in Meister's text are tentatively suggested.

It is foreseen that a critical examination of more unstudied manuscripts may invalidate some of these corrected readings. The author feels, however, that the two family traditions have been definitely established in this dissertation.

Finally, the author contends that the existence of an alternate recension of Dares has been established from the two manuscripts discovered in this study. It remains to support the recension, however, with more manuscripts and relate it to the recension of the *textus receptus*.

Microfilm \$2.95; Xerox \$10.35. 226 pages.

CLASSICAL SOURCES OF PRUDENTIUS

(L. C. Card No. Mic 60-375)

Sister Stella Marie Hanley, Ph.D.
Cornell University, 1959

Prudentius, the greatest Latin poet of the fourth century, adapted Classical poetic forms to produce new variants--the literary hymn, the epic allegory, the dramatic ode--and didactic poems written in epic style on matters of dogma. Steeped in the best Classical literature, he demonstrates admirably in his writings the blending of Classical style and Christian matter.

Prudentius' chief Classical model was Virgil. The *Psychomachia*, an allegory in the epic style, is the most distinctively Virgilian of his poems; the *Contra Symmachum* ranks next in this respect, but all the poems contain much Virgilian material and vocabulary, combined with elements from the other Classical poets. His writings show special familiarity with Lucretius, Horace, Ovid, and Juvenal. The lyric hymns of the *Cathemerinon* earn him a place near Horace and Catullus; in their manner he captures the light spirit of lyric, but achieves greater mystical height and depth. Not only does he write hymns in the iambic dimeter used by St. Hilary and St. Ambrose, but he adapts the old lyric metres with a freshness and dexterity worthy of his Classical forerunners. In didactic poetry he follows in the tradition of Lucretius, with like zeal for the spread of his beliefs and the same awe before the majesty of the universe, but with a further feeling of reverence for God the Creator. Though he did not write satire in the strict sense of the word, he shows an aptness for satiric poetry, particularly in his attacks on paganism in the *Contra Symmachum* and on luxury and avarice in the *Harmartigenia*. He frequently echoes Juvenal, whom he resembles most among the satirists, although he has something of the genial spirit of Horace and borrows some ideas and phrases from Persius--a tendency which has not hitherto been examined closely. He draws also on Ovid's poetry, especially the *Metamorphoses* and the *Fasti*. He appears to follow Ovid in the structure of scenes and in pictorial details, and uses Ovidian mythological themes and matter, often expressed in Virgilian phraseology. The extent of Prudentius' debt to Ovid has before now been only partially investigated.

With his fellow-Spaniards, Seneca the Tragedian and Lucan, Prudentius shares a taste for strong descriptions

of scenes of horror, especially in the *Peristephanon*, where his sense of drama invites comparison with Seneca. His handling of the hexameter is like that of Lucan. In the use of rhetorical style and figures he joins Seneca and Lucan in a trend that was to affect Mediaeval literature. The influence of Statius on Prudentius, which until now has received only passing notice of verbal likenesses, is evident in scenes of the *Psychomachia* and in details of the other poems.

In his concept of the place of Rome in history, Prudentius belongs in a tradition which extends from Ennius through Virgil and into the Middle Ages. He saw Rome, under a Christian Emperor, as the leading power of a world united in homage to the true God; he recalled the great men and achievements of Roman history to prove his argument that God destined Rome for this position of eminence; and he shared the belief of Tertullian, Lactantius, and others, that Rome would continue in her leadership to the end of the world.

Prudentius exemplifies in the best manner the fusion of the Classical tradition in poetry with the expression of Christian ideas. For this reason, and for his genuine poetic gift, he deserves to be ranked with the great poets of Rome. Microfilm \$4.50; Xerox \$15.75. 349 pages.

A COMPARATIVE STUDY OF
MARCUS ANNAEUS LUCANUS AND
SENECA THE PHILOSOPHER

(L. C. Card No. Mic 60-779)

Kay Don Morris, Ph.D.
The Ohio State University, 1959

This study was undertaken as the first step toward the solution of the larger problem of whether a Spanish school of Latin writers really existed in the Silver Age of Latin literature. Of those who were born in Spain, the most prominent and influential were Seneca and his nephew Lucan, and the question of the degree and nature of Lucan's dependence on his uncle's work is the first to arise. It has generally been assumed that much in Lucan's matter and manner, in his point of view and his literary and philosophical theory could be traced to the influence of Seneca. It seemed important, then, first of all, to attempt by a detailed study to determine the validity of this assumption.

In the present investigation I have attempted to ascertain how extensively comparable elements occur in the two writers as they reflect some of the literary characteristics of their age, the nature of their treatment of characteristic ideas and themes, and their purpose in employing them. I have also tried to delineate their philosophic usages as well as the parallels in their language. I intend this study to be principally an investigation of the comparable ideas, views, subjects, and to a certain extent techniques used by both Lucan and Seneca.

The method of procedure then has been to compare the works of Seneca and Lucan in four major areas for possible Senecan influence or lack of it. These areas are the supernatural and the grotesque, learning, philosophy, and language. Secondary areas of study include divination, magic, horror; mythological, historical, astrological and

geographical allusion; neo-Stoicism; and technical aspects of their use of language.

The conclusion reached by this study is that although one can safely describe Seneca's influence on his nephew as considerable, his predominant effect lies in several distinct realms. The evidence derived from this comparison indicates that the primary areas are those of magic, necromancy, and anatomical horror, while the secondary areas would seem to lie in some technical data, philosophic details, and certain elements of language. It is difficult to conceive that the grisly over-sensational aspects of Lucan's realism were not inspired by his uncle's emphasis on such matters. Yet, his training and upbringing as a Stoic, while supervised by his uncle, probably differed little except in its intensity from that given any student. Senecan influence traceable in the employment of vocabulary and language proved to be much slighter than one might expect. The reasons for the differences in Lucan seem to arise not only from the difference in themes and in the style required for epic poetry, as contrasted with those of prose and the drama, but also from Lucan's choice of a Virgilian and Ovidian tradition as the style he required.

Microfilm \$2.50; Xerox \$8.60. 188 pages.

AN EDITION OF GASPARINO BARZIZZA'S
DE COMPOSITIONE

(L. C. Card No. Mic 59-5585)

Robert Paul Sonkowsky, Ph.D.
The University of North Carolina, 1959

Supervisor: B. L. Ullman

The purpose of this dissertation is to meet the need for a critical edition of the rhetorical treatise *De compositione* by Gasparino Barzizza (ca. 1365-1431). The problems in the manuscript tradition which were confronted in the preparation of this edition are discussed in a chapter of the introduction. The rest of the introduction gives an account of Barzizza's life and works, including an unidentified work, and deals with the sources, the content, and the date of the *De compositione*.

Thirty manuscripts were microfilmed and studied in order to establish the text of the *De compositione*. The text of this edition is based on the four manuscripts which seemed to be the most valuable as witnesses to what Barzizza intended for final publication. Our knowledge of the author's exact words has been obscured to some extent by two factors. First, most of the thirty manuscripts examined are "crossed" or "contaminated." This is shown by the varied alignments of readings among the manuscripts, which in this way fail to form intelligible groups, and by some variant readings introduced from unknown sources. Second, new versions of the treatise were made by Barzizza himself or by unknown editors, probably by both. Evidence of these two factors and all the passages that were added to a few manuscripts by an unknown editor are presented in the introduction to this edition. Since the tradition of the manuscripts is complicated in the above manner, ordinary variant readings could not be relied upon in the analysis to show the relationships among the

manuscripts, but errors in the manuscripts within the known quotations from classical authors are used for this purpose with more confidence. In the critical apparatus the four manuscripts upon which the text is based are described in full; the other twenty-six are cited when they contribute readings that are valuable in reconstructing the text.

The rhetorical principles that are expounded in the *De compositione* derive from Cicero, the author of the *Ad Herennium*, Quintilian, Martianus Capella, and probably from an unknown medieval writer. Barzizza follows the plan of book IX, chapter 4, of Quintilian's *Institutio Oratoria* by dividing the treatise into three parts, i. e., on word order, euphony, and clausular rhythm. Gasparino Barzizza's importance for the classical tradition in the Italian Renaissance is well-known. It is hoped that this edition of the *De compositione* may have some bearing on our knowledge of classical rhetoric in the Renaissance. A secondary result of the research undertaken for this dissertation was the finding of two manuscripts of another rhetorical treatise, which has not been identified in recent centuries; a project for publishing it is suggested in the introduction to the edition of *De compositione*.

Microfilm \$2.50; Xerox \$5.60. 112 pages.

LANGUAGE AND LITERATURE, LINGUISTICS

SEBASTIÁN DE COVARRUBIAS' "SUPLEMENTO AL TESORO DE LA LENGUA CASTELLANA": A CRITICAL EDITION OF SELECTIONS FROM THE ORIGINAL MANUSCRIPT.

(L. C. Card No. Mic 60-144)

Betty Bayliss, Ph.D.
University of Illinois, 1959

Sebastián de Covarrubias Horozco (1539-1613) is the author of the *Tesoro de la lengua castellana*, which is the only Spanish dictionary of the Renaissance that contains information concerning the usage of Spanish words, as shown by examples in idioms and proverbs; it is the sole reference work which presents the exact meanings of a host of Spanish words used by Golden Age authors.

The "Suplemento," which includes only the letters A through M, is the same type of work as the *Tesoro*, in that it contains lexicographical, etymological, and encyclopedic material. Although the percentage of encyclopedic information in it is much higher than in the *Tesoro*, the "Suplemento" nevertheless has a great deal of material of considerable interest to linguists and literary critics, and adds even more information to that which Covarrubias presents in the *Tesoro*. Although the *Tesoro* was published for the first time in 1611, and twice since then, the MS of the "Suplemento" has long been neglected. The present anthology is the only edition of the "Suplemento" which has been made.

The length of the "Suplemento" (over 2500 entries) precludes an edition of the entire MS. The general aim in the preparation of the present edition has been to provide

lexicographical information for the study of early seventeenth-century Spanish language and literature; therefore all encyclopedic or quasi-encyclopedic entries which appear in the original have been omitted.

In distinguishing between lexicographical and encyclopedic entries, the following criteria have been used: First, all entries which have proper nouns as the entry word have been automatically classified as encyclopedic and have not been edited. Second, when the entry word is not a proper noun, at least one of the following characteristics must be present in the content of the entry in order for it to be classified as lexicographical: 1. A definition of the entry word. 2. An example of the use of the word in a figurative or metaphorical sense, or in an idiom or proverb.

Numerous entries which have a word other than a proper noun as the entry word have been discarded because the characteristics mentioned above are absent. In these cases the entry word brings to Covarrubias' mind some anecdote or quotation which may actually have no connection with the usage or meaning of the entry word. Entries of this type fall into three general categories:

1. Entries which deal with encyclopedic subjects such as history, the Bible, and science.
2. Entries which supplement the material in the *Tesoro* by presenting a quotation which does not further illustrate the use of the entry word.
3. Entries which simply supply additional etymological material to that which Covarrubias included in the *Tesoro*.

With regard to the technical aspects of the preparation of the present anthology, the original systems of diacritical marks, spelling, and abbreviations have been preserved, but the long form of *s* and the separation of words have been modernized. Certain very limited changes have been made in the capitalization. Two types of changes have been made in the punctuation: The first includes consistent modernization in particular areas (e.g. documentation) in which there is relatively little danger of altering the meaning of what Covarrubias wrote. The second type includes the cautious alteration of occasional punctuation which might mislead or confuse the reader. Changes of a more liberal nature have not been made because the MS is an excellent copy and deserves respect; to work great changes in the text would destroy its value to the philologist.

The Appendix contains a complete list of all the sources presented by Covarrubias throughout the entire MS of the "Suplemento." Microfilm \$2.50; Xerox \$6.40. 135 pages.

A LINGUISTIC ANALYSIS OF THE LONGER IGNATION CORPUS TO ESTABLISH CRITERIA OF AUTHENTICITY

(L. C. Card No. Mic 60-462)

Milton Perry Brown, Jr., Ph.D.
Duke University, 1959

Supervisor: Kenneth W. Clark

In view of persistent and sometimes sharp differences of judgment among New Testament scholars on questions

of authorship or authenticity, this study seeks to apply, and thus to demonstrate the effectiveness of, certain commonly employed linguistic and stylistic tests in relation to the thirteen letters of the longer Greek corpus of Ignatius of Antioch. The primary objective is to establish the reliability of such testing methods as a whole and to evaluate the several tests as criteria of authenticity; secondarily, the study serves to strengthen the traditional division of the Ignatian Corpus into seven genuine and six spurious letters.

The longer recension of Ignatius is an especially appropriate subject for the experiment, since it is analogous in many respects to problematic collections of epistles in the New Testament and--more important--it can be divided (as mentioned above) on the basis of well established textual and critical evidence. That this widely accepted division is correct is taken as the working hypothesis of this study. One of the thirteen letters, "Mary to Ignatius," figures only secondarily in the investigation and is dealt with in an excursus (Appendix D). The study is based mainly upon the critical text of J. B. Lightfoot: *The Apostolic Fathers*, part 2, vol. II (London, 1885).

With the generally accepted division of the Ignatian Corpus (seven genuine and six spurious letters) as the given factor, the procedure is to apply certain customary linguistic tests to these letters and thus to evaluate their relative effectiveness as criteria of authenticity, according to the degree of decisiveness with which they confirm the given division.

Two general areas of analysis are perused: (1) vocabulary and (2) style (including grammatical structure). In each area the two groups of letters are examined for peculiar or characteristic features, which are then compared and contrasted to delineate the major distinctions between "Ignatius" and "Pseudo-Ignatius." Specific tests applied are these: (a) use of words peculiar in relation to other Apostolic Fathers; (b) general analysis of diction (with special regard to theological terms, names and titles of Jesus, etc.); (c) use of prepositions; (d) use of connecting particles; (e) sentence structure; (f) use of modes and tenses; (g) figures of speech; and (h) evidence of literary obligations (with special regard to use of Scripture).

The results of such testing show that certain tests are most valuable as criteria of authenticity--e.g., the general diction analysis and the evidence of literary obligations. Others prove moderately valuable--e.g., use of prepositions. Still others prove less valuable--e.g., use of particles and use of modes and tenses. However, as a whole the methods of testing used are definitely justified by the cumulative result, confirming quite clearly the traditional division of genuine and spurious letters.

Implications relevant for New Testament criticism may be derived from this study. (1) Reliance upon any single test is risky; trustworthiness of such criteria increases in proportion to the number and variety of tests employed. (2) Merely statistical analysis (like the count of particles per page, etc.) can be misleading and should be balanced by attention to other, related factors. (3) Recurrence of typical expressions in a given work does not necessarily rule out the possibility of forgery, but on the contrary such expressions, if unusually frequent, overworked, or inappropriate to context, may prove--on further examination--to be attempts to disguise a forgery.

Thus the analysis shows clearly the general effectiveness of linguistic and stylistic testing and its limitations.

It provides a basis for objectively evaluating the several particular types of criteria. And its results substantiate the traditionally accepted division of the Ignatian Corpus.

Microfilm \$3.45; Xerox \$11.95. 265 pages.

LANGUAGE AND LITERATURE, MODERN

ALLEGORY IN THE HEROIC POETRY OF THE RENAISSANCE

(L. C. Card No. Mic 59-6993)

Danilo L. Aguzzi, Ph.D.
Columbia University, 1959

The epic hero deduced allegorically by Petrarch and Boccaccio from the *Aeneid* is the man capable of undergoing the process of moral refinement. His reward is glory on earth, exactly as, in Aristotle's *Nicomachean Ethics* glory on earth is the reward of the man who has attained the moral habit. The *Nicomachean Ethics*, of minor importance in medieval allegory, thus becomes one of the most important bases of Renaissance allegorical exegesis and allegorical epic poetry.

The impulse given by Petrarch and Boccaccio to the allegorical interpretation of classical heroic poetry was continued by Coluccio Salutati, whose letters contain interesting allegories of the Virgilian and Homeric poems. In the early Renaissance, allegory is used polemically to counteract scholastic viewpoints and to facilitate the victory of the humanistic spirit. This is apparent also in Salutati's *De sensibus allegoricis fabularum Herculis*. The Renaissance tradition of allegorical exegesis of epic poetry is enriched after Salutati with the contributions of Francesco Filelfo, Enea Silvio Piccolomini, Giovanni Aurispa, Antonio Mancinelli.

The most extensive Virgilian allegory written in Italy during the fifteenth century is contained in Landino's *Quaestiones Camaldulenses*. The hero outlined by the humanistic allegorizers has many traits in common with the hero of the fifteenth century moralists. However, neither the allegorical nor the moralistic tendencies so pronounced in some humanistic circles have any influence on the chivalric poets active in Italy in the last part of the fifteenth century and in the early sixteenth century.

Despite Ariosto's lack of interest in moral allegory, the great majority of the sixteenth century copies of his poem were accompanied by allegorical explanations. Dolce, Valvassori, Toscanella, Porcacchi, Bonomone, who are the most popular allegorizers of Ariosto, often distorted the text of the *Orlando* in attempts to adapt it to the moralistic spirit of the Counter-Reformation and to the demands of the Aristotelian critics. The importance of morality in the cultural life of Counter-Reformation society is betrayed also by the commentaries on Aristotle's *Poetics*. Through their interpretation of the Aristotelian element of *ethos*, Robortello, Maggi, Segni and Vettori try to justify a strictly moralistic conception of the function of poetry; often they come close to justifying allegory as a medium of poetic expression.

This double tradition of allegorizing as a means and

moralizing as an end forms the background of Spenser's *Faerie Queene*. Moral allegory of a type similar to that in Spenser is used extensively in the epic poems of Trissino, Giraldis, Bolognetti, Oliviero, Gonzaga. Alamanni and Bernardo Tasso do not include in their long poems any allegorical episodes as extensive as those to be found in the works of the other Counter-Reformation heroic poets. However, like the others, they try to outline in their works the new ideal hero: the gentleman.

The popularity of allegory in Italian epic poetry of the late Renaissance makes it possible to see the *Faerie Queene* as a work which uses Renaissance allegorical methods in a more consistent and orderly way than did the Italian poets. The immediate predecessors of Spenser in his use of the *Nicomachean Ethics* and other details of his allegorical methodology are the Italian epic writers of the Counter-Reformation. His immediate predecessors in his particular conception of the gentleman are the Italian essayists of the late Renaissance. Considered in this light, the *Faerie Queene* presents an aspect which may be called European, since it is the culmination of strains highly developed in Italy and exemplified throughout Renaissance Europe. Microfilm \$7.60; Xerox \$27.00. 599 pages.

THE INFLUENCE OF EUROPEAN TRAVEL ON THE
POLITICAL AND SOCIAL OUTLOOK OF
HENRY ADAMS, WILLIAM DEAN HOWELLS,
AND MARK TWAIN.

(L. C. Card No. Mic 59-6616)

August Lynn Altenbernd, Ph.D.
The Ohio State University, 1954

I

From the earliest times Americans have shown a mixed attitude toward Europe; sometimes they have tried to identify themselves with the rich historical and cultural tradition of the Old World, and at other times they have emphasized the unique destiny of the United States as the haven of freedom. Among pre-Civil War writers in America, Irving and Longfellow represent the romantic pilgrims who sought to recapture the shadowy grandeurs of the past, while Cooper, Hawthorne, and Emerson represent the group who used their travel as an opportunity to analyze Old World society and to compare it with the United States. By the time Henry Adams, William Dean Howells, and Mark Twain went abroad in the '50's and '60's, these traditions of writing on European travel were well established.

When Henry Adams went to Germany to study civil law in 1858, he was continuing a family tradition, for his great-grandfather, John Adams, his grandfather, John Quincy Adams, and his father, Charles Francis Adams, had all had first-hand experience with Europe, either as diplomats or as students. The professional Anglophobia of the Adams family was counterbalanced by Henry's early introduction to French, by his reading of English authors, and by James Russell Lowell's tales of his recent travel as a student in Germany. When Henry graduated from Harvard in 1858, his parents agreed to send him to Europe to study civil law. When Henry subsequently found that his plan for studying civil law, German, Latin, and Greek simultane-

ously in Berlin was too ambitious, he repeatedly attempted to justify his idleness in Europe. Against the objections of his brother, he maintained that his two years in Europe would prove to be the most valuable of his career, but he was unable to say just how or why his experience would be valuable to him.

William Dean Howells's boyhood experience of Europe came almost wholly through literature, for although he was aware of the British origins of his family, he did not know anyone who had recently traveled in Europe. In addition, the Middle West in the years before the Civil War was far more concerned with westward expansion than with current happenings in the Old World. Yet the books young Howells read were at first almost exclusively English, and his knowledge of Great Britain was enhanced by some acquaintance with British periodicals. His reading of Continental literature led him to learn Spanish, French, and German well enough to translate poems and stories for local papers, and to explore European literature in the original. This reading developed in Howells the ambition to devote his life to literature, which he thought of as something refined and removed from daily life. His desire for fame as a poet led him toward the literary centers of the East, and toward Europe, where in the romantic bloom of antiquity he could write poetry that would idealize American life. As a reward for writing a campaign life of Lincoln, Howells was given the consulship at Venice.

Still farther west, Samuel Clemens as a boy felt less direct influence from Europe than Howells did. We do not know how much European literature he read as a boy before he became a river boatman, but we do know that he became fairly familiar with the humorous sketches of frontier life which by the 1840's had become a common feature of American newspapers. As a compositor, he set type for a number of such items, and his own first efforts at writing followed the established patterns of frontier humor. In the Nevada silver fields and in San Francisco after the outbreak of the Civil War, Clemens continued to develop a kind of humorous journalism that depended for its effect on a constant supply of new subjects unfamiliar to his readers. Since travel was the most effective way of supplying these subjects, he made journeys to Hawaii and New York for material. When the chance came in 1867 to join the Quaker City excursion to Europe and the Holy Land, Clemens saw an opportunity to continue the kind of writing that had already brought him national fame as Mark Twain. Seeking neither education nor romantic atmosphere for its own sake, he went abroad as a journalist to find new subject matter.

II

From October, 1858, to October, 1860, Henry Adams lived in Germany as a student at Berlin and Dresden. His difficulties with the language soon forced him to give up his play to study civil law, and he enrolled in a *Gymnasium* to learn German. During vacations he traveled to Italy, Sicily, France, and the Netherlands. In Sicily, shortly after its liberation by Garibaldi, he discovered at first hand the rising democratic movement which he understood to be following the American example. He wrote a series of newspaper letters about his travels, and thus discovered a career as journalist which would make use of his training and also permit him to follow the traditional family career of aristocratic guide to American democracy.

On his return to America he went to Washington as secretary to his father, a Massachusetts congressman. There, in the winter of 1860-61, he saw democratic government working under stress and was led to speculate on the philosophic foundations of democracy. When his father was appointed Minister to Great Britain, Henry served as his secretary in London from 1861 to 1868.

Intense loyalty to the Union made Adams unusually sensitive to the prevailing Confederate sympathies of the ruling class in London, so that he became bitterly anti-British. At the same time he found comfort in the pro-Union sympathies of Britain's political left, so that his anti-British feeling became specifically anti-monarchical. Such leaders of the reform movement as John Bright and William E. Forster frequently cited the United States as the example English working men should strive to emulate in their struggle for freedom and the good life. As a result, Adams came to think of America as marching at the head of the democratic advance that would overturn the thrones of Europe. Adams' London experience confirmed his choice of career as a servant to democracy, and even before he left England, he produced several magazine articles designed to influence domestic policy in the United States.

But while Adams was becoming a more ardent American in political theory, he was also discovering the treasures of European art and the satisfactions of social life in a mature country. While he was in England, he reviled the stupid solemnity of social events, but he found the society of Boston and Washington barren by contrast after he returned home. The result of his experience in Europe was in part the realization of his father's fears, for it unfitted him for America without making him at home in Europe.

In his position as consul at Venice, William Dean Howells had adequate leisure to read, write, and travel. His earliest efforts at poetry were so infrequently accepted by American magazines that he turned to the journalism he had already mastered. A series of newspaper letters about Venice formed the substance of his first book, *Venetian Life* (1866), and of *Italian Journeys* (1867). These books had a significant influence on Howells's career, for travel writing requires photographic realism, and Howells' recognition of literary value in such writing led him away from his romantic conception of the poet. In addition, his writing gradually evolved from travel sketch to novel. The full literary realization of his experience in Venice came only when he turned to fiction and developed the international theme in such novels as *A Foregone Conclusion* (1874), *The Lady of the Aroostook* (1879), *A Fearful Responsibility* (1881), and *Indian Summer* (1886). In these books, the major complications arise from contrasts between cultures, for the leading characters are usually traveling Americans who attempt to apply the standards of their native land to Europe.

Mark Twain's contact with Europe was less intimate and briefer than that of either Adams or Howells. In his newspaper letters on the 1867 pleasure excursion of the steamer *Quaker City*, he gave a more superficial and impressionistic view of Europe than either Adams or Howells had done. *The Innocents Abroad* (1867) represents a fusion of two traditions: it applies the technique of frontier humor to the European scene, and, to a greater extent than is usually recognized, it perpetuates the conventional travel account. The humor of the book is most often directed at Twain's fellow tourists; the sober passages alternate

between ecstatic praise of Europe's beauty and strenuous condemnation of its filth, poverty, and human degradation.

A Tramp Abroad (1880) is a far less satisfactory book. Twain imitates the devices of *The Innocents Abroad*, but uses them less successfully here than in the earlier work. Both the enthusiasms and the nonsense are forced, for by 1879 Twain had outgrown the personality that produced *The Innocents*.

Like Howells, Twain first emerged as a literary man in his early travel writing. Not only did he refine his use of humorous devices, but he developed his skill at reproducing the unfamiliar scene with the kind of total realization that characterizes the best of his later work.

III

An analysis of the ideas of the early travel writing of our three authors shows the concept they held of America and her role in history.

Fellow tourists, a phenomenon of perennial interest for travel writers, were assumed to be representing their nations, and to offer a fair sample of the character of their nationalities. Distrust and animosity were the feelings most often expressed toward other travelers. Englishmen were most often criticized, usually for a selfish disregard for the comforts of others, while American tourists were lampooned for their noisy assertion of superiority, and their pathetic eagerness to soak up European culture indiscriminately.

One of the most prominent ideas in travel writing is that there is a national character, a relatively permanent set of physical characteristics, mental qualities, attitudes, and patterns of behavior shared generally, if not universally, by the people of a nation. British character was alleged by Adams and Howells to be treacherous and brutal. Because of England's sympathy for the slave power in the Civil War, they asserted that England had betrayed the natural alliance of the Anglo-Saxon peoples. Their observation of Englishmen at home and abroad was that the national character was of an almost animal coarseness. Howells found the Italians to be childlike but crafty. Adams thought the Germans charmingly simple and bumbling, while Howells objected to the childishness of their social pleasures. Twain admired France on his first visit, but by 1879 he accepted the stereotype of the Frenchman as lecherous and effeminate. Our writers usually identified American character as essentially Anglo-Saxon, but attributed to it refinement, purity, and manliness superior even to the British qualities. This superiority was usually alleged to be an effect of democratic institutions.

All three of the writers complained of the inferior physical comforts of European life, objecting particularly to the lack of a real sense of home in European families. They found social affairs formal and unrewarding after the relaxed gaiety of American society. These observations on social life led to wholesale evaluations of civilizations in which it was charged that the society of Europe was radically corrupt, whereas in America free institutions and the absence of classes contributed to the nurture of self-reliant men who were nature's noblemen.

While usually acknowledging the superiority of European art and architecture to American work, they offered several arguments to offset this admission. They suggested that the future belonged to America in art as in

politics, that European art was venerated merely because it was old and famous, and that European art was not suitable for American viewing because it offended the equalitarianism and morality of the New World.

In no field did the three young men feel more confident of American superiority than in the area of politics. They held that the visibly better living conditions in the United States were the product of its democratic institutions and that no other political system could so well foster the growth of human personality. They also maintained that the American system represented the goal toward which history was moving, and that the example and encouragement of the United States would hasten the overthrow of European monarchy and its ally, the corrupt Church. In addition, Howells and Adams attributed treachery and materialism to European governments, while maintaining that the United States was motivated by humanitarian idealism in its open-handed dealings with foreign powers.

These first trips to Europe were themselves a demonstration of the thousand ties of literature, commerce, institutions, and blood relationship that bind the New World to the Old. In the flush of discovery our travelers sometimes forgot that they were returning to our old home, but the influences of a common cultural tradition were at work nonetheless.

IV

When Henry Adams returned to Washington in 1868, he was prepared for a career as servant to his native democracy, but within ten years it was evident that his expectations were not to be fulfilled. Adams's ventury into reform journalism and the collapse of the Independent movement of 1876 both contributed to his growing disillusion with democratic government, and he came to believe that machine politics was a stronger force than democratic idealism. In addition, Adams reconsidered the philosophical bases of democracy as he wrote his *History of the United States* (1889-1891), and concluded that as early as 1814 the American experiment had failed because circumstances were stronger than men, and because the Jeffersonian theory had put too high an estimate upon human nature.

By 1890 Adams had lost the conviction of his youth that the American nation was marked out for a peculiar destiny as the savior of mankind. This disillusion, coming at about the same time as his wife's suicide, liberated Adams so that he could form new impressions without preconceptions on his world-wide travels in the '90's. In the South Sea Islands he observed the vigor and simple effectiveness of primitive life; in Normandy he discovered the wonders of medieval architecture; in Russia he got a glimpse of the vast empire which increasingly figured in his thought as a center of power in competition with a cluster of states surrounding the Atlantic.

Partly as a result of these travels, Adams formulated a theory of history which asserted that human energy was dissipating and that civilization would crash early in the twentieth century. This anti-progressive and deterministic theory was a denial of the dream of democratic progress which Adams had held as a youth in London. After 1895 Adams visited France almost every year until his death to seek refuge from the chaos of his own time in a world which he synthesized from medieval architecture, philosophy, and song.

For almost twenty years after his return to the United

States in 1865, William Dean Howells exhibited an unbroken contentment with American life. A brief return to Europe in 1882 and 1883 confirmed his optimism about his homeland, for he was now more impressed by the poverty and gloom of ancient cities than by their romantic charm. Although he was not entirely ignorant of politics, Howells was relatively undisturbed by the corruptions of the Grant regime. But in about 1885 his interest in the personal moral problem began to evolve into a concern over social injustice. By 1889 he showed a direct concern with economic problems in *A Hazard of New Fortunes*, and by 1894 he had developed a personal variety of democratic socialism which he described in *A Traveler from Altruria*. Howells never actually deserted the idea that American life is superior to European, but he did gradually become convinced that the American dream would never be fulfilled. The Spanish-American War marked the end of an era for Howells; he vigorously opposed American imperialism, and concluded that the role of the United States in the Philippines implied the cloes of the peculiar mission of America as an encouraging example to struggling mankind.

Mark Twain's comments on Europe after his early trips abroad are marked by intense and unqualified emotion. When he was not concerned with attacking or defending, Twain gave a vividly accurate report of the mingled dark and light of American life, but when he was defending America against such critics as Matthew Arnold or Paul Bourget he was violently emotional. Twain's charges against Europe in the '80's and '90's were a continuation of the attitudes that appeared in his earliest travel writing. He maintained that America had given the world the great blessings of material progress, that America had pointed the way toward freedom, that only under America's democratic institutions could men ever reach full stature, and that American character was elevated above European in morality, generosity, and delicacy of feeling.

Twain's residence and travel abroad in the '90's produced some of his most subdued travel writing. He reverted to his earlier enthusiasm for the English, and his objection to imperialism as a swindle was tempered by his beliefs that conquest of primitive peoples by civilized nations seemed inevitable and that England had brought much progress to the regions she had conquered. But he was able to be tolerant toward imperialism only as long as the United States was not involved. When American troops entered Cuba in 1898, Twain applauded the move as a humanitarian crusade, but when the Philippine phase of the war began, he joined the Anti-Imperialist League and attacked America's position as a betrayal of her humane, democratic traditions. At the end of his life a strong element in Twain's bitterness was his insistence that the American dream had been betrayed, and that Americans had lost their ancient sympathy with oppressed people struggling for life and liberty.

Microfilm \$3.75; Xerox \$13.05. 290 pages.

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LAS COMPANIAS BANANERAS EN LA
NOVELISTICA CENTROAMERICANA
[Spanish Text].

(L. C. Card No. Mic 60-358)

Eneida Avila, Ph.D.
Tulane University, 1959

Chairman: Daniel Wogan

En esta investigación presentamos un estudio literario-sociológico de un determinado número de novelas centro-americanas. La temática de ellas se centra en los problemas del campesino de las regiones bananeras y en la crítica contra las compañías dedicadas a la industria del banano, en especial la United Fruit Company. Esta producción novelística es principalmente de contenido social y se ha impuesto como documento implacable de denuncia y de protesta. Es nuestro propósito analizar estos problemas tendiendo a una visión integral de lo histórico, lo literario y lo cultural.

La literature de protesta social que tiene por escenario las zonas bananeras, nos presenta el panorama de los complejos problemas del diario vivir del obrero. También incluye la importancia de éste en el acontecer histórico-social. Acaso convenga aquí explicar que la expresión literaria así concebida, más que producto de ficción, es el resultado vivo y actuante de experiencias vitales. Su autenticidad es de gran valor.

En Centroamérica esa angustiosa voluntad de crearse una tabla de valores, esa búsqueda ansiosa de una definición espiritual profundamente nacionalista, ese querer saber quiénes somos y a dónde vamos, es lo que ha orientado y guía la novela de protesta social. El obrero es incorporado en esta forma como parte de esa inquietud vital. La brega contra los elementos de la naturaleza y la lucha por la conservación de los valores nacionales ayudan a sustentar esta tesis. En cuanto al inquirir por lo nacional como expresión del sentimiento nativo es lo que hoy predomina. En oposición a los factores anteriormente mencionados aparece la influencia cultural norteamericana. Es el motivo de discordia y de lucha, aún sabiendo que es necesaria e indispensable al mundo industrial.

La honda preocupación del novelista centroamericano está presente al querer darnos una obra de arte en toda su variedad y multiplicidad. Algunos consiguen esta vinculación entre su producción artística y sus experiencias; otros no. Con frecuencia encontramos que el escritor lleva a su obra la realidad tal como él la percibe y en otros casos tal como él la ha vivido, añadiendo a todo esto, su mensaje específico. Dentro de ese marco general se puede establecer en cada novela dos planos: el literario y el de la realidad social.

En cuanto a metodología hemos dividido el material conque contamos en dos partes. La primera parte consta de dos capítulos. En el primero discutimos los antecedentes literarios de la protesta, en especial la novelística que va a marcar el camino a la denuncia contra las compañías bananeras. A manera de preámbulo antes de examinar las obras describimos el panorama histórico general de cada país centroamericano, en particular los hechos que guardan relación con el establecimiento y desarrollo de los consorcios bananeros. Comentamos las peculiaridades estilísticas, pasajes costumbristas y míticos siempre y

cuando que estén relacionados al problema que estudiamos. El grupo de obras son: Carmen Lyra, 'Bananos y Hombres,' serie de cuentos publicados en el Repertorio Americano (1931); Fabián Dobles, 'La mujer negra del río,' cuento publicado en la Antología del cuento centroamericano, I (1950); Carlos Luis Fallas, Mamita Yunai (1941); Ramón Amaya Amador, Prisión verde (1950); Paca Navas Miralda, Barro (1950); Emilio Quintana, cuento 'La Señorita,' de la Colección 'Bananos,' publicado en la Antología del cuento centroamericano, II (1950); Alberto Ordoñez Argüello, Ebano (1954); Miguel Angel Asturias, Viento fuerte (1951), El Papa Verde (1954) y Week-end en Guatemala (1955).

Dedicamos la segunda parte al análisis sociológico de las novelas. Discutimos la presentación del 'gringo,' del 'entreguista,' del obrero explotado y de la política de extorsión de las compañías bananeras. Luego la confrontamos con la realidad empírica que tuvimos la oportunidad de ver y conocer, lo mismo que con el material recogido en las entrevistas con los obreros en Centroamérica en los principales centros bananeros.

Con todo este material presentamos el punto de vista del novelista y el de los trabajadores de las zonas bananeras. Y nos fué posible diferenciar lo que es técnica creativa del autor de lo que es la realidad social. Al mismo tiempo describimos el panorama general de la vida de estas zonas centroamericanas.

En un Apéndice final transcribimos diecinueve entrevistas por ser las más completas y las mejor logradas.

Microfilm \$3.05; Xerox \$15.10. 235 pages.

CHARACTER AND POINT OF VIEW IN
REPRESENTATIVE VICTORIAN NOVELS

(L. C. Card No. Mic 60-461)

Vereen M. Bell, Ph.D.
Duke University, 1959

Supervisor: Lionel Stevenson

Among the technical developments in nineteenth-century fiction perhaps the most significant and obvious is the introspective method of presenting character. After Dickens and Thackeray character is rendered less in terms of action, than in terms of consciousness; less objectively than subjectively; and less apprehensible as social identity than comprehensible as a network of conflicting motives and only half-articulated psychological impulses. There can be no question that George Eliot, Meredith, James, and their successors in the twentieth century, as psychological novelists, render a deeper and therefore more significant reality than those writers who play across the surface of character. True character is complex, inconsistent, and variable, and what a man is is what he thinks; to magnify this aspect of human nature is to extend the regions of human understanding. But if it is a truth of life that character is complex, it is a truth of fiction that the more complex character becomes, the less easily apprehended or conceived it is; and the modern novelist who explores character at its source in the mind tends to ignore its manifestation in life as personality. It is the purpose of my study to examine the changing concepts of character as well as the corresponding adjustments of fictional

method; to demonstrate in terms of each author's purpose why the change takes place; to show how the position of the reader in relation to the character affects the illusion of reality; and to weigh in some measure the relative merits of the internal and external methods of presentation.

Novelists treated include Dickens, Thackeray, Emily Brontë, George Eliot, Meredith, and James. In general one representative novel has been selected from the works of each author for concentrated analysis, although this pattern has not been followed consistently in cases of conspicuous and pertinent exceptions. It is suggested that the "inward turning" in English fiction is primarily the result of increased moral sophistication in the novelist. A novelist like Dickens, for example, who deals in relatively simple moral distinctions, is free to dramatize his characters boldly in terms of their own language and social posturings, without reference to involved and ambiguous psychological states. Henry James, on the other hand, to convey his intensely personal vision of moral order must reproduce the atmosphere of the mind; his standard of behavior is relative to the situation in which the moral act is conceived; his later novels are a search for the "hard latent value" in experience, and his "vessels of consciousness" are conceived to weigh conflicting values and finally to articulate James's particular reading of experience. Dickens conceives his characters as distinct and tangible social entities; the "vessels" of James are identified less vividly by complex and amorphous intellectual processes. Dickens neglects the mind, James neglects the physical fact and the life of colloquial speech. Between these two poles are intermediate positions or compromises. The balance is perhaps best preserved in the work of George Eliot, whose novels are not fully emancipated from the tradition of Dickens and Thackeray, just as her moral philosophy is not thoroughly emancipated from the Christian Ethic.

After George Eliot the English novel tends to have less "life" than intellectual substance. In "analysis," as in the more idiomatic stream of consciousness, a deeper reality is offered at the sacrifice of tangible social personality. James and later psychological novelists render aspects of character that we cannot appraise with our ordinary modes of perception; they create an illusion of character that seems devitalized, only by inference related to the familiar and irrepressibly human surface of life; theirs is an illusion that we can be intellectually aware of, but not one that our senses can know.

Microfilm \$3.45; Xerox \$11.95. 265 pages.

**GEORGIAN POETRY 1912-1922: "GEORGIANS,"
GEORGIAN MAVERICKS, AND RUPERT BROOKE.**

(L. C. Card No. Mic 60-9)

Saul Galin, Ph.D.
Columbia University, 1959

The purpose of this study is two-fold: to examine critically the poems in the five Georgian anthologies, published biennially between 1912 and 1922 by Harold Monro under the editorship of Edward (later Sir Edward) Marsh, as well as poems by Georgians outside the anthologies, in order to arrive at a definition of Georgian poetry; to evaluate the work of maverick Georgians, in particular that of Rupert Brooke.

The study is divided into five chapters. The first chapter deals with the beginning of the Georgian "movement," the poets represented, and the difficulty of defining the movement. The second and third chapters deal with the dominant themes in and the style of Georgian poetry. They develop the idea that the Georgians, in the anthologies, detached themselves from the world about them and fled to a remote, cloistered, and beneficent nature. Repelled and frightened by the seeming horror of contemporary life, most of the Georgians escaped from themselves; in cutting themselves off from contemporary life, they neither criticized nor rejected their age by opposing it with the fullness of a personal vision. Their failure made them incapable of translating personal experience into vital and dramatic poetry.

Chapter four deals with some poets whose work in the anthologies is not representative of their total output. For example, Marsh included poems by Sassoon, Gibson, and Masfield, but he deliberately excluded Sassoon's savagely satirical war poems, Gibson's *Daily Bread*, concerned with the tragedies of working-class people, and Masfield's realistic account of the conversion of a sinner in *The Everlasting Mercy*. I have examined these poems because they define for us more precisely the characteristics of Georgian poetry.

The final chapter concerns Rupert Brooke. At the time of his death in 1915, Brooke was the most prominent Georgian and the one who held out the highest hopes for English poetry. One important critic wrote in 1916 that Brooke was a reincarnation of John Donne. By 1922, however, with the publication of *The Waste Land*, the tide had begun to ebb, and from that year to the present Brooke's reputation has declined steadily. Today most of us think of Brooke as a gorgeous Georgian relic. This estimate of Brooke is just as far as it goes, but it does not give us all of him. Brooke was an amphibian. Part of him was Georgian, and that part we know only too well. But there is another side to him--the humorous, the satirical, the ironic, the tough-minded poet with a feeling for the absurd; in a sense, the modern poet with an intellectual sensibility. It is this side of Brooke that I have developed in the final chapter of this dissertation, with the aim of rescuing him from the unmerited oblivion into which he has fallen.

Microfilm \$2.60; Xerox \$9.00. 198 pages.

**SEED OF FELICITY: A STUDY OF THE CONCEPTS
OF NOBILITY AND GENTILESSE IN THE MIDDLE
AGES AND IN THE WORKS OF CHAUCER.**

(L. C. Card No. Mic 59-5177)

Alan Theodore Gaylord, Ph.D.
Princeton University, 1959

An examination of Chaucer's writings will indicate how prominent the word families of *gentil* and *noble* are in his courtly vocabulary, and how often he concerns himself with the definition of true nobility and true gentilesse. The commonplaces "virtue is true nobility," and "gentilesse resides in virtue, not in blood," are elaborated not only in the *Wife of Bath's Tale* and the *Balade of Gentilesse*, but seem also to have unusual life elsewhere, appearing in one form or another as part of the conceptual framework of much of the poetry.

The question of the significance of Chaucer's use of these concepts, and of their relevance within a body of courtly verse, leads to a consideration of the tradition in which Chaucer wrote, as it was related to a "literature of nobility." There are several contexts, common to Chaucer and other medieval writers such as Dante and the authors of the *Roman de la Rose*, that are involved in any definition of nobility or gentillesse. By far the oldest is the philosophical context. In Stoic thought, particularly that of Seneca, a pattern can be found that is repeated all through the Middle Ages: a definition of nobility is directed to the human spirit more than to a social class. The seed of nobility of soul is planted within all, and the thoughtful spirit endeavors to bring to fruition the good nature that is potentially his. Within the philosophical context, class consciousness in the usual sense is not an issue at all, although both Seneca and Boethius made use of the concept to exhort the aristocracy to live up to the magnificence that should be theirs. Within the theological context, the emphasis is less upon a nobility of ordered virtue than it is upon an inheritance of grace. The Christian church added to the philosophers' tradition its own ideas of the common fellowship of the elect and of the nobility granted through the charity of God. St. Augustine best illustrates this "medieval synthesis," as he works out his theology of love, grace, spiritual order and nobility.

Within medieval literature, these contexts must be further understood in light of the social structure of the times. Medieval France, in the 12th and 13th centuries, is a model of how the establishment of a knightly nobility was adding still another dimension to the conception of the noble way of life, as the "gentil" way became equated with the "noble," and *gentillesse* developed a double meaning: noble birth, and cultivated behavior and mien. The literature that is written for this class offers a wide variety of instances where the traditional concepts of nobility are used to instruct the noble class itself. The wide range of the concept may be seen extending from elementary training given to young nobles, the instructions in rule and behavior given to princes and magnates, and the treatises on spiritual nobility, to a large body of imaginative literature exploiting the concept thematically in a variety of ways.

Chaucer draws upon most of these themes in his own poetic critique of the English situation in the 14th century. A close examination of his work reveals his lively awareness of the way some of the traditional concepts were becoming empty shells, as the realities of society created an increasing tension between the old language and new interpretations. This is to indicate the possibility of irony both in delineation of character and in telling of tales, which a study of *Troilus and Criseyde* and the *Canterbury Tales* bears out. The *Troilus* may be seen as the tragedy of the failure of noble potential, in which the word, *gentillesse*, is adroitly and revealingly twisted in its application to mirror the extent of the self-deception and hypocrisy amidst the gentils of the world of *Troilus*. And within the various world of the *Canterbury Tales*, framed by the "noble" ideals of the Knight and the Parson, it is the Franklin most of all who reveals the irony of one in quest of a *gentillesse* defined in terms of the letter had not the spirit, in terms of a social gentility almost entirely out of contact with traditional philosophical and theological definitions. Microfilm \$7.25; Xerox \$25.90. 572 pages.

HAMLIN GARLAND'S USE OF THE AMERICAN SCENE IN HIS FICTION

(L. C. Card No. Mic 59-4628)

Elbert Leroy Harris, Ph.D.
University of Pennsylvania, 1959

Supervisor: Dr. Charles Boewe

The problem in this thesis was to find out how Hamlin Garland obtained his knowledge of the American scene, to discover what he knew about it, to explore the extent of his use of it, and to depict how he translated his knowledge into his fiction. The thesis is the first comprehensive study of Hamlin Garland's development of American materials and sources in his writings, particularly his fiction. In the words of Taine, the study emphasizes "la race, la milieu, et la moment."

The source materials are from Garland's own correspondence, forty books of fiction and non-fiction, and the one hundred and twenty manuscript boxes of materials at the University of Southern California, Los Angeles. In the manuscript sources, the unpublished notebooks were extremely valuable because they revealed two hitherto unpublished short stories, illustrative of Garland's early interest in the philosophy of naturalism, and considerable unpublished social criticism; in fact the best Garland social criticism is found in the notebooks and remains unpublished. Furthermore, the letters to Garland from his friends--Fuller, Flower, Gilder, Howe, and Howells--are important because these men frequently advised Garland in his early literary efforts. The extent to which Garland did or did not accept their advice is answered here.

The dissertation unfolds Garland's use of veritism, realism, romanticism, naturalism, and social criticism. His methodology is examined. The parental and environmental influences on his writings are discussed and portrayed. One of the recent controversies in American literature concerns the reasons why Garland, who began his literary career on realistic and naturalistic notes, should turn to romanticism. The problem is thoroughly examined in this thesis and some conclusive new evidence on the problem is given by Garland from an unpublished notebook. However, in his later years, despite romanticism, Garland despaired and became disillusioned. The thesis gives the reasons for the touch of tragedy in Garland's later years.

The thesis concludes that during the major portion of his literary career, Garland was a romanticist, that he was influenced in varying degrees by Howells, Kirkland, Flower, and Fuller; that his environment was a paramount factor in the creation of all his fiction; that the use of the American scene and its many pertinent problems is negligible; that he was definitely a reformer only in his early years; that he was indebted to Henry George's *Progress and Poverty* for his social philosophy; that social criticism is poor in the fiction but is good in the unpublished notes.

Finally, what is the measure of Garland's greatness to American literature? Why should he be the subject of a dissertation? Why should he be discussed in any good book on American literature or American civilization? The answers are these: Hamlin Garland, along with Crane, London, and Norris, was a pioneer in the philosophy of naturalism as applied to American literature. It is true he never expressed that philosophy very long and never was a deep practitioner of it; nevertheless, the components

of naturalism in his early works are unmistakable. He was the first farmer-writer from the West who pictured the deep pathos, drudgery, and toil in the lives of the farmers; and Garland's greatness will always rest on those early short stories that reveal the struggles of these farmers to survive. The major testimony came from the experiences of the writer himself--Hamlin Garland.

Microfilm \$3.65; Xerox \$12.40. 283 pages.

THE NOVELS OF ALDOUS HUXLEY

(L. C. Card No. Mic 60-31)

Charles Mason Holmes 2nd, Ph.D.
Columbia University, 1959

Aldous Huxley's novels, reflecting the development of his thought, present such ideas as the "life-worship" of D. H. Lawrence, the pacifism of Canon Dick Sheppard, and the "non-attachment" ideal derived from Gerald Heard. They deserve close study as novels, however.

Huxley employs three basic structures in his novels. The first of the dialogue novels, the Peacockian *Crome Yellow*, is a polished work of art. In *Those Barren Leaves* the dialogue form is distorted. In *Point Counter Point* it is modified by other superimposed patterns. *Antic Hay*, the first plotted novel, shows a protagonist failing to escape from post-war emptiness. *Eyeless in Gaza* employs a jumbled plot to emphasize its hero's conversion. The plot of *Time Must Have a Stop* is inadequate, that of *The Genius and the Goddess* buried in discourse. *Brave New World* is an ingenious reverse utopia, a structure adapted unsuccessfully in *Ape and Essence*. The pleasing hybrid structure of *After Many a Summer* is marred by Propter's lengthy monologues.

Character in Huxley's novels is rarely an end in itself. The early obsessed eccentric is used satirically in *Point Counter Point* and didactically in later novels. The self-divided "heroes" usually make theme or thesis explicit. Denis, Gumbril, and Chelifer are ineffectual romantic idealists with a sexual conflict. Philip Quarles, Anthony Beavis, and Sebastian Barnack are more fully developed characters who learn from Huxley spokesmen. Of these attempts at the "good" man, only James Miller is convincing. Among other talkers, Scogan and Cardan are created for amusement, Mustapha Mond and the Arch-Vicar present important ideas. John Rivers is a combined "hero" and spokesman who also serves as narrator.

Attitude and point of view are also important. Huxley is tolerant in *Crome Yellow*, a minor comic masterpiece. *Antic Hay*, a burlesque, betrays hostility but lacks a norm of feeling. The confusing *Those Barren Leaves* combines prejudice, tolerance, objectivity and joke. In *Point Counter Point*, however, a variety of attitudes is masterfully expressed. Huxley effaces himself in *Brave New World* and enjoys his world immensely. Characters in *Eyeless in Gaza* are by nature unlikeable; in *After Many a Summer* they are dominated by Huxley. In *Time Must Have a Stop*, attitude is ineffectively established. *Ape and Essence*, with three narrators, exhibits a Huxley again prejudiced toward his characters. Narrator Rivers' wisdom, in *The Genius and the Goddess*, is wordy and labored. Irony is

common to all of the novels; it appears in many forms and on every level.

The suggestive, symbolic detail appears in various forms. Image symbols are frequently employed, particularly in *Eyeless in Gaza*, where they are combined in a complex and meaningful pattern, and in *Antic Hay*. Symbolic juxtaposition, or montage, appears occasionally. Symbolic allusion, in text and title, is significant, especially in *Brave New World*. The escape from egocentric enslavement is the typical symbolic action; it sometimes becomes a quest for spiritual peace. Huxley also experiments, inconsistently, with allegory.

The novels are less often works of art than masks of a mind usually confused and frequently obsessed. Psychic conflict has prevented aesthetic triumph. It appears as an insistent fictional "syndrome" in the detached, autobiographical "hero"; in Huxley's sense of guilt; in his obsession with sex; and in his ambivalent attitude toward art. Huxley is an important satiric novelist, weakened ultimately by a reluctance to accept humanity.

Microfilm \$3.80; Xerox \$13.30. 294 pages.

LAS IDEAS DE PIO BAROJA. [Spanish Text].

(L. C. Card No. Mic 60-361)

Carmen Iglesias, Ph.D.
Tulane University, 1959

Chairman: William J. Smither

En Pío Baroja predomina una constante preocupación ética que, sin pretender una finalidad dogmática, sólo aspira a la verdad, a la justicia y a la sinceridad. El contraste entre sus anhelos morales y la corrupción que observa por doquier despierta en él un profundo pesimismo y agudiza su espíritu crítico. Baroja no sólo se convierte en el censor de la sociedad, sino que pasa revista y enjuicia todos los aspectos del pensamiento. Sus ideas más trascendentes se centran alrededor de la filosofía, la religión, la ciencia y la literatura.

Baroja se dirige a la filosofía esperando hallar la verdad que no encuentra a su alrededor. A través de Kant y de Schopenhauer descubre el relativismo del conocimiento humano: el primero le afirma en su concepto moral; el segundo, en su pesimismo y en su compasión por el género humano. Busca otras direcciones filosóficas, pero no puede adaptar su temperamento ni al nirvana búdico, ni a la ataraxia recomendada por Pirrón. Heráclito, en cambio, aunque no le ofrece reglas de conducta, le estimula con su teoría del devenir. La influencia de Heráclito se funde con la de Nietzsche por un tiempo. Del superhombre nietzscheano Baroja forma sus hombres de acción. Quiere dotar a estos personajes con los rasgos que considera necesarios para triunfar en la vida y que él --demasiado preocupado con escrúpulos morales-- no ha podido conseguir. Sin embargo, los hombres de acción barojianos nunca llegan a dar una impresión completa de fortaleza, de crueldad, de cinismo o de astucia y al final de cada novela casi todos quedan vencidos por la preocupación ética del novelista. Cuando la acción por la acción fracasa,

Baroja sigue pensando que el hombre no debe permanecer inactivo y proclama que el trabajo, aunque sea el pequeño trabajo cotidiano, es la única solución digna para olvidar el dolor de vivir.

Su angustia vital no encuentra consuelo en la religión. La descomposición que observa en la iglesia católica le aparta del cristianismo y le inspira algunas de sus más violentas censuras. Por otra parte, su agnosticismo le impide aceptar la idea de un dios antropomórfico y las prácticas y misterios de que se rodean las distintas religiones.

Baroja se vuelve a la ciencia y en ella, definitivamente, deposita su fe y su esperanza. La ciencia es lo único que no engaña, lo único que, dentro de la limitación del conocimiento humano, puede ofrecer verdades relativas, pero verdades al fin; lo único que avanza siempre, sin detenerse ante nada. Baroja ama ese carácter impersonal, casi implacable de la ciencia, tan desligada de los problemas humanos, pero tan pura y tan fiel a sí misma.

La literatura le ofrece la posibilidad de llevar a cabo sus sueños y de proclamar sus verdades. La obra barojiana es un reflejo de su vida: su honradez profesional, su dedicación al trabajo, su espíritu crítico, su independencia, su sinceridad y sencillez, hacen de sus novelas un mundo donde la maldad y falsedad son fustigadas, los convencionalismos sociales satirizados, donde los héroes amorales fracasan y donde el autor, por su odio a la mentira, no llega nunca a crear caracteres de ficción. Baroja copia la vida simple y honradamente. Y como la vida son sus novelas y es su estilo: algo multiforme y dinámico, en cuya perpetua fluencia se cumple el eterno devenir heraclítico. Microfilm \$2.80; Xerox \$9.70. 214 pages.

OSCAR WILDE'S DRAMATURGY

(L. C. Card No. Mic 60-265)

Norman James, Ph.D.
Duke University, 1959

Supervisor: Lionel Stevenson

Oscar Wilde's plays were written during the last decades of a century in which conditions had been unfavorable for English playwrights but had gradually improved. In addition to legal improvements, there were smaller theatres, shorter bills and longer runs, while certain managers and playwrights effected higher standards of ensemble playing and increased the playwright's prestige. By the 1880's Wilde could turn to writing plays as a possible source of income, and by the 1890's the English theatre was ready to do justice to his comedies.

The structure of Wilde's four non-comic plays shows an eventual emancipation from two French types, the well-made play developed by Scribe and altered by Sardou, and the romantic drama of Victor Hugo. In *Vera* (1880) and *The Duchess of Padua* (1883) there are violent peripeties, resounding curtains and sudden changes of heart by leading characters. In *Vera* the witticisms of Prince Paul, who foreshadows the dandies of the comedies, are more effective than the serious plot and partially contradict it. *The Duchess of Padua* shifts erratically from one theme to another. With *Salomé* (1892) and *A Florentine Tragedy*

Wilde achieves greater concentration on a single effect, but at the price of exaggerated emotionalism in *Salomé* and mediocrity until the final paradox of *A Florentine Tragedy*.

The structure of Wilde's four comedies shows an eventual emancipation from the French thesis play. *Lady Windermere's Fan* (1892), *A Woman of No Importance* (1893) and *An Ideal Husband* (1895) are greatly influenced by the thesis plays of Augier and Dumas fils. Wilde's theses involve a broader conception of virtue than one generally finds in Augier and Dumas, but there is the same sentimentalizing of virtue. There are dandies in each play, however, whose comic view of life partly counter-acts the earnestness of the theses. In *Lady Windermere's Fan* and *A Woman of No Importance* the conflict between serious and comic themes is not resolved successfully. In *An Ideal Husband*, in spite of some sentimentality, these themes are resolved in favor of the more vivid comic one, for Wilde makes a comic butt of Sir Robert Chiltern, who functions sentimentally in the serious plot. An element of political satire in the characterization of Sir Robert helps bring this about. Where, in Wilde's first two comedies, the comic scenes either slow down or altogether halt the action, which otherwise is carried along by the devices of well-made melodrama, in the last two acts of *An Ideal Husband* these devices are treated largely as farce.

This structural development is completed in Wilde's final comedy, *The Importance of Being Earnest* (1895). The serious man is now an entirely comic figure, and for the first time the *grande dame* who appears in each of the comedies functions importantly in the plot. Although the plot moves more steadily than in the thesis plays, a relaxed style distinguishes this play from the nineteenth-century English and French farces that it resembles.

The most successful characterization in Wilde's plays is that of the *grandes dames* in the comedies. They are characters with whom he is somewhat sympathetic while satirizing them. A great deal of their vigor is imparted by the overflowing incongruities of their language. While the serious dialogue in Wilde's plays is stylized rhetoric that we cannot take seriously, such stylization is often effective in the epigrams of the wits. With the comic view of life that the wits expound, and the opposing view of the characters Wilde satirizes, his comedies at their best take nineteenth-century English drama to the threshold of the discussion play that will flower shortly afterwards.

Microfilm \$3.35; Xerox \$11.70. 258 pages.

THE MORAL DEMONSTRATION IN THE NOVEL OF MARCEL PROUST

(L. C. Card No. Mic 60-36)

Alvin Vincent Labat, Ph.D.
Columbia University, 1959

Metaphysics and art have been so well fused in Proust's novel that the problem of the distinction and the relation between the two in moral terms has become paramount in Proustian criticism.

Proust's metaphysical ideas are concerned with the nature, essential properties, and relations of beings; he calls them essences, and he believed that their sole means

of communication was in art. Essences are innate; they form the reality of the universe which dwells permanently within us, and they are kept hidden from us through the combination of rational intelligence and habits contracted in society. Man has an intuition of their existence, and it is this intuition which Proust sees as constituting the salvation and immortality of man. The function of art is to arouse the intuitive in man, to put him into contact with his essence. In this respect art has a moral value incommensurate with any existing moral doctrine.

In *A la recherche du temps perdu* Proust has united art and morality to formulate a view of reality which is that of the artist. Proust's artist is a translator of the intuitions of existence and purpose which lie secreted. He is an illuminator who would reveal to others general laws governing the life of man. If truth is within us, then there are no exterior ends outside of ourselves; it is only by turning inward that we are able to certify.

Proust's ideas on the novel are anti-thesis and anti-moralizing. In his work a hierarchy of values, which are demonstrated, forms the framework on which he builds the novel. The values are those of essence so that an individual's moral worth is determined by his expression of essence. Since the society he depicts is a rigidly classified one, there is a direct relationship between the social hierarchy and the ethical scale. At the very top, the purest elements of the nobility have an illustrative value in moral form and an aesthetic value inherent in their names. Proust connects his ideas of human authenticity and of Good, Truth, and Beauty when expressed by individuals who have remained faithful to their heritage. Once his narrator has observed the moral relativity of people in a society whose outstanding characteristic is an effort to cast off original identifications, his fundamental intellectual consideration becomes the relationship between the outer, sensory world and the subjective, invisible world which he has found within himself. In outer reality he distinguishes moral disinterestedness from the egoism of society in general, and in art a means of returning society to the natural, inner values which it has lost in its exteriorization.

Proust's great theme of passion, his ideas of time, his characteristic use of metaphor, and the overall structure of the novel are intrinsic in his moral demonstration. Although his welding of aesthetics and morality connects him with Chateaubriand, Vigny, Flaubert, Baudelaire, Bergson, and the Symbolists, his novel has its antecedents in the rational philosophers, particularly in Descartes. For Proust gave to his novel a philosophical background whose metaphysics have truth, wisdom, and virtue as their end. Beauty is the sensuous, imaginative medium containing the ideals of the essence of the moral life.

Microfilm \$2.50; Xerox \$7.20. 153 pages.

TRAGEDY AND COMEDY IN HOFMANNSTHAL'S DRAMATIC WORKS

(L. C. Card No. Mic 59-6940)

Marie Therese Lehn, Ph.D.
Washington University, 1959

Chairman: Professor Liselotte Dieckmann

The purpose of this study is to investigate one important aspect of the literary work of Hugo von Hofmannsthal, namely the development within his dramas from tragedy to comedy. Criticism on Hofmannsthal has labored under a number of misconceptions from the time of his earliest publications in the last decade of the nineteenth century to the present time.

Hofmannsthal acquired fame at an early age by his lyrics and the publishing of short lyrical plays in the impressionistic manner. Around the turn of the century his lyrical capacity allegedly disappeared and the phenomenon of "Hofmannsthal's metamorphosis" occurred. From that time on the poet turned to the drama as the main outlet for his artistic creativity. Criticism of Hofmannsthal's own time saw in this turning from one form of writing to another a sign of creative weakness and a complete reversal from the early, highly acclaimed productions. This misconception has been overcome by contemporary criticism. However, modern critics, particularly in Germany, stress the philosophical ideas contained in Hofmannsthal's later works, without considering the fact that the turning toward the drama necessitated, on the part of the poet, a new approach to form and structure.

This study undertakes to prove by careful and detailed analysis of a selected number of plays that Hofmannsthal's development toward the drama was a consistent and organic one. Even the early plays contain, in the guise of a highly lyrical form, germs of the two main dramatic categories: tragedy and comedy. As a transition from the early phase to the dramatic period of Hofmannsthal's work a number of prose writings of the first decade of the twentieth century are investigated. These are written in the form of fictitious letters or dialogues and contain not only a number of important ideas reflecting the struggle of the poet to master the dramatic form, but also represent in their form additional proof of Hofmannsthal's preoccupation with drama and the theater. They display, in prose form, a number of dramatic scenes. Hofmannsthal's well known dissatisfaction with the word as means of expression finds its partial solution in his intent to add to the medium of words a theatrical scene, colors, gestures and the effects of light. Even in these prose works tragic and comic elements are already present.

When Hofmannsthal turned to free adaptations of existing dramas he chose tragedies, with the intention of acquiring tools for dramatic writing. With one exception the tragedies thus created must be regarded as experimental failures. They carry a heavy burden of philosophical and metaphysical introspection which generally weakens their dramatic impact and structure.

Only when the poet turns to comedy as a form of dramatic expression do his works acquire additional stature both in

character and form. This turning to comedy coincides with an added maturity in outlook and the desire to be understood by the audience. The factors contribute to make the comedies Hofmannsthal's most satisfactory achievement within his dramatic work. The achieved excellence in the form of high comedy is particularly important and of great value for German literature in general, for Germany does not possess, as do France and England, an established tradition in this form of drama.

Microfilm \$4.00; Xerox \$13.95. 310 pages.

GIDE ET LA VERTU.
[French Text].

(L. C. Card No. Mic 60-679)

Joseph Camille Marek, Ph.D.
University of Kentucky, 1954

Supervisor: Dr. Hobart Ryland

Gide est vraiment susceptible de l'épithète de moraliste. Mais la morale de Gide se veut nouvelle et révolutionnaire. D'où la polémique dans l'œuvre de Gide contre les idées, les mœurs, les hommes, les morales et les vertus de son époque. Ni la société, ni les idéologies ou les religions - Catholicisme, Protestantisme, Libre pensée - ni le fond commun d'idées que les hommes les plus divers ont sur la Vertu, ne trouvent grâce à ses yeux. A tous les hommes de son époque et à la plupart de ceux que l'on précédé, Gide reproche d'avoir identifié "Vertu" et "Contrainte" et d'avoir ainsi, institutionnalisé la morale. Partout la Lettre a eu raison de l'Esprit.

C'est donc l'idée de disponibilité totale qui est au centre de l'œuvre de Gide et qui est la clef secrète aussi bien de ses intrigues romanesques que de ses analyses plus théoriques. Nous devons être prêts à répondre à toute sollicitation naturelle d'où qu'elle vienne et pour cela ne nous abandonner jamais définitivement à aucune. Etre disponible, c'est se laisser aller au plaisir du moment, c'est aussi être capable de l'effort d'y renoncer pour se porter vers un autre. D'ailleurs cela ne forme qu'un: plaisir, effort et plaisir de l'effort. Le héros gidien peut donc tout se permettre même ce qu'il blâme le plus chez autrui - par exemple, l'expérience religieuse dans *Numquid* et *Tu* - car ce qu'il reprochait au croyant, cela n'était pas d'être croyant, c'était de n'être que cela.

La disponibilité gidienne constitue bien une morale. D'abord parce qu'elle se déploie normalement dans la pratique d'une vertu. Le langage de la vertu est le langage constant de l'œuvre de Gide. Gide insiste souvent sur le caractère objectivement vertueux de la conduite du héros gidien. C'est à des ressorts vertueux que cette conduite fait appel même et surtout quand elle tend à commettre ce qui aux yeux de l'époque peut passer pour vice ou crime. Ensuite parce que la disponibilité gidienne révèle à l'analyse ce minimum de cohérence sans lequel on ne peut parler de morale.

La morale de Gide s'investit en un humanisme qui sans pour autant la restreindre - tout ce que fera l'homme pourra toujours être appelé humain - lui donne un contenu. Gide apparaît alors comme un des grands hommes de l'histoire de l'humanisme qu'il développe et renouvelle

d'ailleurs considérablement, faisant ainsi écho à certains des grands mouvements d'idées de son époque.

La plupart des difficultés de la morale gidienne tournent autour de l'ambiguïté fondamentale de la notion de disponibilité. On peut lui reprocher le caractère fallacieux de sa prétention à l'universalité obtenue aux dépens de l'authenticité; l'impossibilité profonde où elle se trouve de jamais nous procurer l'expérience de la fidélité. Surtout, le vague de la notion de disponibilité peut donner au Gidisme les disciples les plus divers, et quelquefois les plus compromettants comme Sade, les plus malvenus comme certains chrétiens.

Mais alors où est la réalité de cette morale où chacun peut se trouver chez soi? L'œuvre même de Gide révèle pour le héros gidien imaginaire (mais alors qu'en serait-il d'un héros réel?) les pires difficultés à la pratique de la disponibilité et finalement elle semble bien admettre l'échec de l'aventure gidienne. Sans compter l'accusation d'égoïsme dont se défend bien mal la doctrine gidienne et surtout son auter.

Il faut pourtant prendre garde d'être injuste envers la tentative de Gide. On a le plus de chance d'être équitable à son égard en le replaçant très précisément dans son époque et en comprenant ainsi qu'elle traduit le drame d'une génération et que ses difficultés ne sont pas des failles dans la pensée de Gide mais des difficultés réelles à quoi se sont heurtés Gide et sa génération. On aperçoit alors la morale gidienne comme un moment difficile mais irremplaçable de l'histoire de la vertu. On se persuade alors de sa perennité.

Microfilm \$4.95; Xerox \$17.55. 386 pages.

THE DRAMATIC WORKS OF
GASPAR DE ZAVALA Y ZAMORA

(L. C. Card No. Mic 59-5566)

Frederick Carlyle Martin, Ph.D.
The University of North Carolina, 1959

Supervisor: Sturgis E. Leavitt

The eighteenth century has always been regarded as a "sterile" age in Spanish literature. For this reason few literary historians have investigated the writers who were active during that period. As a consequence, the researcher interested in making a specialized study of a particular writer finds few secondary sources available. Hardly any biographical information on Zavala exists, and many of the details provided by the histories of literature are suspect. Primary sources, except for the works themselves, are practically non-existent.

Zavala y Zamora is admittedly a minor playwright. He was, however, extremely popular during his day and apparently exercised considerable influence in theatrical circles. Zavala occupies an important position in the transition from the "romanticism" of the Golden Age to that which developed later in the nineteenth century.

Zavala began writing in the late 1770's and continued until his death around 1813. All of his plays, regardless of the type, show that he was considerably influenced by the ideas which were filtering into Spain from France after the accession of the Bourbons to the Spanish throne. The

element of sentimentality which reached Spain from England by way of France is strongly apparent in Zavala's dramas. In spite of foreign settings and neo-classical leanings, the prevailing ambience is unmistakably Spanish.

Zavala was a political opportunist, and his plays, particularly those written during the French occupation of Madrid and after their defeat, have strong suggestions of political inferences.

Zavala's name was before the theater-going public until the early 1830's. His works show that he was a product of his period. The fact that he is given only passing mention in most literary histories gives evidence of his lack of importance today, not his importance during his lifetime.

Microfilm \$4.95; Xerox \$17.55. 387 pages.

AN ANALYSIS OF RAMÓN PÉREZ DE AYALA'S NOVELS AS A PLEA FOR FREEDOM

(L. C. Card No. Mic 59-6991)

Mary-Berenice Morris McCall, Ph.D.
Bryn Mawr College, 1959

Although Ramón Pérez de Ayala's art has been praised by many prominent critics, both here and abroad, there has been a definite reticence to examine his works in a detailed manner. The great popularity of the Generation of '98 probably eclipsed some of the attention Pérez de Ayala merits; but the "avoidance" of this writer's works seems to stem from a certain confusion over what he is saying in them, more than from the complex nature of his art. This study analyzes the Ayala novels in the light of the subtle, but consistent, plea they make for individual freedom, in the hope of elucidating both their technical aspects and their ideological content.

In Chapter I the traditional characteristics of the Spanish novel, and then the tendencies of the twentieth century novel are briefly reviewed as a prelude to a presentation of the fundamental aspects of Pérez de Ayala's art. This presentation relates the novelist to both the traditional and the modern novelistic art of Spain, in order that his originality and his historical position may be established.

Chapter II examines the structure of the novels in a detailed fashion, so that the significance of the consistent interpolation of certain a-novelistic forms--e.g. theatrical, poetic, and epistolary--may subsequently be illustrated. The movement of each work, its organization, and its external peculiarities are also studied as keys to its context and as indications of the author's artistic goal.

In Chapter III the style of each novel is first analyzed individually. An effort is made to show that there is an unbroken line of development from the "semi-realistic" style of the early works to the poetic style of the last novels. The contribution of modernism, the varying use and the implications of irony, and the basis for counterpoint in Pérez de Ayala's style are also discussed. Finally, the author's stylistic aims are exposed by citing passages from his books and articles which illustrate how his aesthetic ambitions parallel his aspiration towards freedom.

The fourth chapter presents the protagonists of the novels as Don Quijote's, Sancho's and Don Juan's; other characters are described as Celestina's, Calisto's, and Melibea's, not only because the author frequently alludes

to the prototypes from the literature of Spain's Golden Age, but because the essence of these works is a clash between tradition and originality. The primary characters and those in an intermediate realm are shown to be in conflict with the vacuous provincial life of Pilares. Therefore, the protagonists are contrasted to the secondary characters, unambitious and self-satisfied souls, who represent the acquiescence and ignorance of provincial Spain. This leads to a consideration of the comic and the tragic elements in the characterization of Pérez de Ayala's novelistic beings, as a typical expression of Spanish and twentieth century art.

In Chapter V the ideology expressed in these novels is broken down into a series of "subjects." Special emphasis is placed on both the importance of the pedagogic intent and the seriousness of the linguistic theories in Ayala's fiction. The various "subjects" are then shown to be aspects of the theme, love, which is the beginning of individual freedom, and thus, of great creative achievement.

The Conclusion illustrates the relationship between love and tolerance, and then tolerance and justification. The ability to justify the infinite diversity of this life is discussed as the property of the tragic spirit, and of the individuals who, Pérez de Ayala optimistically believes, are the precursors of greater freedom for all.

Microfilm \$4.05; Xerox \$11.40. 315 pages.

MINOR FIGURE: A BIOGRAPHY OF OCTAVE THANET.

(L. C. Card No. Mic 60-444)

George L. McMichael, Ph.D.
Northwestern University, 1959

Supervisor: Harrison Hayford

This is a study of Octave Thanet, the nineteenth century American authoress whose real name was Alice French. It attends to the details of her life and her major works and attempts to place her in the stream of American Literature of the last century.

The dissertation begins with a discussion of her heritage and early life in Andover, Massachusetts and Davenport, Iowa. It then moves to an examination of her education in Davenport, at Vassar College, and Abbot Academy in Andover.

Her first attempts at writing took place in the 1870's. By the 1880's, she was a noted contributor to Harper's, Scribner's, The Atlantic, and The Century, first as an essayist dealing with sociology and economics, later (on the advice of Richard Watson Gilder of The Century) as a short story writer and novelist in the tradition of the local colorists.

At her peak of popularity, she was one of the most successful of the women writers of later nineteenth century America. Howells acclaimed her superiority to her fellow local-color writers, and she was praised by her literary acquaintances, who included Sarah Orne Jewett, Horace Scudder, Mary E. Wilkins Freeman, Thomas Wentworth Higginson, Hamlin Garland, Theodore Roosevelt, and Andrew Carnegie.

She energetically supported the status quo and the

conservative traditions she favored, in the face of what she felt were literary and other attacks on the essentials of Americanism. But at the turn of the century, she was made aware that not only were her economic theories no longer shared by all thinking Americans, but that her literary reputation and that of her fellow local colorists was falling in public esteem, when the components of that form of regionalism--dialect, homey investigation of out-of-the-way America--became uninteresting to the major portion of literate America taken with the newer realism and naturalism.

In her last years, she suffered not only literary but also economic collapse, and she died the victim of the kind of uncontrolled economic storm which she had advocated (as a disciple of Spencer and other Social-Darwinists) as a means of eliminating the feeble and the useless. She died at the age of 83, in 1934.

A bibliography of her works is included.

Microfilm \$4.40; Xerox \$15.55. 344 pages.

EMERSON'S THOUGHT IN ENGLISH TRAITS

(L. C. Card No. Mic 60-20)

Philip Loveless Nicoloff, Ph.D.
Columbia University, 1959

Although English Traits has been one of Emerson's most widely read works, it has received relatively little scholarly attention. This study is designed to correct this neglect by determining (a) the circumstances under which English Traits was composed, (b) the nature of the ideas which it contains (together with their probable sources), and (c) the place which it occupies in the development and exposition of Emerson's thought as a whole.

Section I deals largely with the book's biographical setting. On his first trip abroad in 1833 Emerson successfully exorcised the evil spirit of a personal English cultural dominance; the result was an increased confidence in his own intuitive life. But by the time of the second trip in 1847, Emerson's attitude towards England had undergone a fundamental change. He was now prepared to engage the whole complex problem of English national success, and to transform English history into a mythos of the universal human predicament.

Section II is concerned with the genesis and evolution of the ideas which underlie Emerson's study of the English. The key to an understanding both of the form and the philosophical content of the book is found in a theory of history and race which Emerson had gradually evolved over several decades. In his eclectic reading are to be discovered the chief elements of this theory; cyclical theory from the Greeks, the German romantics, and Carlyle; the concept of a dialectic of national ideas from Hegel and Victor Cousin; geographical determinism from Johann von Herder and Robert Chambers; the representative roles of Bacon and Locke from Samuel Coleridge; embryological latency from Robert Chambers; the deleterious effects which accompany cultivation from Charles Lyell and Jean-Baptiste van Mons; the persistence of racial characteristics from Chambers and Robert Knox; and so on. These ideas Emerson synthesized into a rather complex concept of national cycles: (a) always out of a savage condition

comes the new nation; (b) geographical forces select the race and establish its constitutional temperament; (c) the youthful nation is stimulated into power by the synthesis of an Idea (idealism) with the characteristic national trait; (d) the golden age ends when a new philosophy (empiricism) replaces the old; (e) once the flowering is past, only by a migration to "more electric skies" and by the addition of fresh "savage blood" can the old vitality be restored; no nation experiences a recovery of power.

Section III examines the employment of these ideas in English Traits itself. Emerson began with a discussion of the Englishman as a product of geographical selection and biological evolution, moved on to an analysis and evaluation of the "Saxon man" (the best of actual races), related the initially fruitful but now inhibiting effects of English institutional life, and concluded with a summary of the causes of the English spiritual flowering in the Elizabethan age and of the nation's decline ever since. The flowering, Emerson argued, while possibly the result of a Divine "infusion," was yet prepared for and timed by biological processes. Both the flowering and the decline were the result of a necessary organic cycle.

The Conclusion notes that while little claim can be made for the originality of the specific contents of Emerson's historical philosophy, their synthesis is uniquely his own. More than any other of his works, English Traits makes clear Emerson's late inclination to see human history in terms of some long-range destiny implicit in racial seed and the fated cycle of circumstance. Far from requiring simply the casually extemporized journalism which some critics have described, the task of analyzing and appraising English success carried Emerson to the very heart of his mature belief.

Microfilm \$5.00; Xerox \$17.55. 390 pages.

THE POETIC WORLD OF WILLIAM CARLOS WILLIAMS

(L. C. Card No. Mic 60-22)

Alan B. Ostrom, Ph.D.
Columbia University, 1959

The purpose of The Poetic World of William Carlos Williams is to afford a way to the understanding of Williams' poems by establishing the nature of the "world" he has made in them and by clearing away the current misconceptions of his intent. The first chapter begins, therefore, by showing that the twentieth-century "risorgimento" was not, as popularly supposed, an era of chaotic disagreements, but that the other major poets of the period, Pound, Eliot, and Stevens, held almost identical fundamental esthetic positions. It compares their critical statements on various matters in order to show their similarity of purpose and theory and to provide the reader with a series of reference points by which he may see Williams' participation in the common ideas of the time.

In Chapter II it is first necessary, as Williams himself has warned, to collect and examine his scattered statements of his "theory of the poem." His most important concepts are: (1) art as "useful knowledge" and art as the highest form of government, the means to living well in this world; (2) the dominant role of the imagination in the

imagination in the creative process and the inherent inferiority of pure reason, in everyday life as well as in art; (3) the underlying wholeness of the world, as contrasted to men's fragmentation of all existence into the human, the natural, and the mechanical; and (4) the universal as existing only in the local. By using these ideas the chapter can proceed to show what kinds of things Williams uses in his poems and why he chooses them: only in an "imaginative array" of common, known things can the poem be a replica of the actual world that will adumbrate the real wholeness of existence and be useful knowledge about the nature of things and of Williams' central concern -- men.

Examining how Williams uses his materials, Chapter III seeks out his subjects: "no ideas but in things." It takes as a unifying theme Williams' statement "Divorce is the sign of knowledge in our time." From this central idea of the dissociation of the naturally unified elements of existence (for him the process of science and philosophy) derive all his moral, esthetic, and social ideas. For Williams is a moral poet and essentially didactic, though neither given to preaching and exhortation nor a subscriber to conventional "morality"; his moral scheme springs from his esthetic, since art is the highest form of knowledge and the best transmitter of "truth." Thus the chapter examines his subjects -- what he writes about; his attitudes toward (1) love and sexuality, (2) organized society and the natural world, (3) the mind and the body, (4) time and place, (5) art and science (and technology) are all presented in his poems as parts of the problem of divorce vs. wholeness. From this it is apparent that what Williams writes about is the traditional concern of the poet, although the terms ("things") in which he presents his subjects are not. His poetic "world" is for the most part the world he knows most intimately -- the physical and intellectual world of his own locality in time and place.

Chapter IV concludes that thus seen, Williams is clearly an extremely valuable poet, not only for the general reader, but for the young poet. If he is not a truly great poet, he is certainly one of the very best America has yet produced. He has helped to bring modern poetry back to the world it lives in; in so doing he offers the reader a deeper understanding of himself and his place in the world, and he affords the poet materials and methods with which to come to a "period of mastery."

Microfilm \$3.05; Xerox \$10.60. 234 pages.

THE BEADLE STORY PAPERS, 1870-1897: A STUDY OF POPULAR FICTION.

(L. C. Card No. Mic 60-783)

Louis George Pecek, Ph.D.
The Ohio State University, 1959

Story papers published by the firm of Beadle and Adams invite study because they are in themselves a fascinating, almost forgotten phase of American literary history. Moreover, as frankly commercial attempts to please a mass audience and as the basis of dime novels, they are valid sources by which one can investigate mass culture and popular taste. To some critics such fiction is "the nearest thing we have had in the country to . . . a true 'proletarian' literature"; others consider it "an objecti-

fied mass dream, like the moving pictures, the soap opera, or the comic books that are the present-day equivalents of the Beadle stories." To see how the Beadle story weeklies help objectify a mass dream and how they represent the habits and mores of a mass audience is the aim of the dissertation.

The Beadle story papers appeared in three successive runs: the *Saturday Journal* (1870-1882), *Beadle's Weekly* (1882-1885), and the *Banner Weekly* (1885-1897). Ten writers--Prentiss Ingraham, Albert W. Aiken, Joseph E. Badger, Frederick Whittaker, Oll Coomes, Anthony P. Morris, Jr., Charles Morris, Mary Reed Crowell, Metta V. Victor, and William F. Cody (Buffalo Bill)--supplied 410 of the 607 serialized novels published in the weeklies. The works of these authors, representing the entire run of the Beadle weeklies, are studied in the dissertation.

Central chapters discuss the primary types of story-paper novel--domestic, western, and detective, analyzing the formulas employed by such fiction and exploring their social-cultural implications. The domestic tale contains the basic device of all story-paper novels: the happy-ending reunion theme. The western tale emphasizes (1) the hero of action, an analogue of Leatherstocking; (2) the romantic hero, often melodramatically tragic; or (3) the "real life" hero, exemplified by Buffalo Bill. The detective tale, a more formularized later development in story-paper fiction, stresses the basic, episodic chase formula and the recurrent disguise motif.

The study confirms the hypothesis that story papers romanticized experience in order to please a mass audience composed of unsophisticated, conservative middle-class adults and thrill-seeking, teen-aged boys. To heighten the aspirations of middle-class adults and impressionable youth, writers created heroes and heroines, who, though apparently low-born and uneducated, were always discovered to be genteel and heirs to fortunes. The compromise also made villains of individual capitalists, although it carefully avoided attributing villainy to the entire class. Like most magazine fiction, furthermore, story-paper novels shaped a world explicitly Caucasian and implicitly Protestant. The greatest story-paper compromise with reality, however, concerned sexual morality and was paralleled in most contemporary publications. Conservatism led to complex and unrealistic formulas that prevented a heroine's appearing guilty of any immoral sexual activity.

Popular fiction still makes such compromises today. But twentieth-century mass fiction often aims more particularly at either juveniles or at unsophisticated, middle-class adults. Story papers, however, made their appeal to both groups. Boys and adults alike were thrilled by vivid, often bloody tales simply told and easily read. Unsophisticated, conservative adults were offered light fiction, exciting, yet inoffensive, didactic, yet amusing.

Microfilm \$3.05; Xerox \$10.60. 233 pages.

ENGLISH NATIONALISTIC POETRY, 1485-1558.

(L. C. Card No. Mic 60-784)

John Roland Pierce, Ph.D.
The Ohio State University, 1959

Pre-Elizabethan Tudor poetry and verse contributed most to the growth of English patriotism and nationalism

in three general ways: (1) by continuously advertising the authority of Tudor monarchy, (2) by leading the attack on foreign influences and designs of every sort, and (3) by propagandizing the military glory of England both past and present. The first contribution was initiated by the court poets and picked up later by the popular writers, the second was sponsored about equally by intellectual and popular poets, and the third was advanced strongly by the popular writers and echoed by the intellectual circle. Furthermore, early Tudor poets provided vivid and emotional reflections of a number of ideas which were primarily prose concerns. The Tudor theory of kingship, the importance of education, the nature and authority of law, the principle of duty to the state, and the use of the longbow are subjects which fall in this category.

The poetic tendency to be immediate, localized, and often personal contributed strongly to the regular employment of subjects with patriotic and nationalistic prestige to demanding social, political, and religious questions. Duty to the state, a classic ideal revived as an end in itself by humanists in prose, shows the effect of medieval adaptation in pre-Elizabethan verse, where it appeared often, before Wyatt and Surrey, as a means to other ends. Skelton drew heavily on the ideas of public duty and English law to condemn his personal enemy, Wolsey, while anonymous popular poets employed the same ideals to indict clerical responsibility for a number of social evils. New pride in the vernacular was called to support the attack on Roman control of the English church, and the English longbow was commissioned periodically to lend symbolic prestige to a variety of causes.

The sanction of power, which was to play such a strong role in developing nationalism under Henry VIII, had two distinct foci in early Tudor England. To Henry VII's foreign court poets, power meant the crown, as typified in Bernard André's "Les Douze Triomphes de Henry VII" (c. 1497). To the anonymous baronial apologists, power manifested itself in the great noble Houses of Percy, Stanley, and Howard. This divergence of practical interests affected the early Tudor poetic approach to history. The court poets eulogized the House of Tudor and forged a historic link with great British kings (particularly Arthur), while the popular writers recorded the contentious history of the highly competitive noble Houses and reviewed their military accomplishments.

A distinct evolution may be noted from the defensive and often negative tone of fifteenth-century political poetry to increasingly militant and positive pre-Elizabethan verse. The theme of unity, which found constructive expression in Henry VII's marriage to Elizabeth of York (1486), is traced from civil to national concern for unifying England and Scotland under Henry VIII. The effect of Henry's break with Rome lent a positive tone to isolationist sentiment. The poetic expression of growing assurance and self-sufficiency is traced through the areas of language, law, fighting spirit, heroes, archery, history, and expansion.

Poetry and verse give a clear picture of the emotional center of early Tudor patriotism and nationalism; but apart from some pieces of Wyatt and Surrey, there is little of literary value in the mass of material, which includes the work of André, Skelton, Barclay, More, Roy and Barlow, Crowley and many anonymous writers. Early Tudor patriotism and nationalism, in poetry and verse, is a cumula-

tive, incremental awareness of expanding areas of native pride rather than a strong governing principle.

Microfilm \$5.65; Xerox \$20.05. 442 pages.

THE MOTIVATIONS OF THE MILITARY CAUDILLO IN SELECTED MEXICAN NOVELS: 1910-1937.

(L. C. Card No. Mic 59-6391)

Edwin Hemingway Pleasants, Ph.D.
University of Missouri, 1959

Supervisor: Dr. John S. Brushwood

It is the purpose of this study to investigate the personal motivations of the military caudillo as interpreted by the authors of selected Mexican novels of the Revolution written from 1910-1937. The first date marks the beginning of the Mexican social revolution; the latter is the point at which the Mexican novel ceases to stress the revolution and begins to emphasize post-revolutionary problems. A study of several works preceding 1910 which are of a precursory nature are included. A few works which were published after the date of the main study also appear when their content is relevant.

The novels of the Mexican Revolution clearly indicate that the initial motivation for caudillo revolt is a very personal one. At the start, it has at best an indirect relationship to national policy. It is not based originally on noble ideals, though the personal protest may be justified. It is self-centered. It does not take into consideration the feelings and aspirations of other people except insofar as such aspirations coincide with the protest and ambition of the individual caudillo. There is no initial effort to defend the people from indignities. Caudillismo begins as a protest against indignities suffered by the individual and not against abuses suffered by any group.

Since one individual cannot make much of a protest alone, he seeks the company and support of others who have suffered similar privations and similar feelings of inferiority. It is not altruistic interest that causes the would-be caudillo to gather together a group of rebels. It is the force of circumstances. Only within a group can the individual express a personal protest effectively. At this point enters the first thin thread of hypocrisy. The major emphasis of the individual must be made to seem the major emphasis of the group. That the revolutionary group can function at all under such circumstances is due to the strong possibility of getting the right solution for the wrong motivation. Group action may bring reforms which will help both the group and the individual, though actually the individual is primarily interested in his own problems.

A small revolutionary group then finds itself in the same position before large national armies and political parties, as the individual before the local group. The small group is not adequate to establish a new order at the national level. It must join a major national group. At this point, the national campaign sets up an idealistic program to satisfy at least to some extent the aspirations of each individual. The national leader, primarily concerned with his own personal interests, accepts the national

platform as an instrument for his own advancement. He may be interested in the platform as a secondary interest because he feels it is just or because he would be ashamed to oppose it but the primary motivation will be his self-interest. Microfilm \$3.10; Xerox \$10.80. 237 pages.

LES DIALOGUES DE PAUL VALÉRY.
[French Text].

(L. C. Card No. Mic 60-26)

Jeanine Parisier Plottel, Ph.D.
Columbia University, 1959

The purpose of this thesis is to study the thought and art of Valéry's dialogues. We have not attempted to systematize the contents of these works under a set of subject headings, but have sought to analyse each of them separately so as to preserve their individuality.

Eupalinos, which expounds an overwhelming number of ideas, seeks above all to show that the life of the creator is far more profound than the life of the thinker: it is only through the discovery or the construction of some form that man may find an object which infinitely transcends him.

L'Ame et la Danse is itself a kind of ballet. Socrates, Phaedrus, and Eryximachus watch a dance spectacle and describe what they see: each of their thoughts is echoed by the movements and gestures of the dancers until ideas and images unite in a final climax. As the discussions and the spectacle progress, there emerges an increasing understanding of dance as the "pure act of metamorphosis" and as the antidote to the weariness and the tedium of life.

In *l'Idée Fixe* a doctor and a writer meet by the seaside and attempt to destroy most human values and endeavors. Mind, personality, knowledge, language, science, modern culture are but idols, and as such, are bitterly criticized by the two protagonists. Only the creative act emerges unscathed from their attack.

The *Dialogue de l'Arbre* is a pastoral dialogue inspired by Virgil's *Eclogues*. The tree is shown as a symbol of love, of the unconscious forces to which man is a prey, and finally of thought itself.

The final chapter studies Valéry's art of the dialogue. Structure, technique of improvisation, depiction of characters, method of composition are examined and lead to the conclusion that the originality of these works does not dwell in their content but in the form which sustains it.

Microfilm \$2.50; Xerox \$7.00. 148 pages.

A STUDY OF THE STYLE AND VOCABULARY OF
THE PROSE FICTION OF VALLE-INCLÁN

(L. C. Card No. Mic 59-5575)

Manuel D. Ramírez, Ph.D.
The University of North Carolina, 1959

Supervisor: N. B. Adams

The importance of Ramón María del Valle-Inclán in contemporary Spanish literature and his significant con-

tributions to the Hispanic language make his work a desirable subject for linguistic and stylistic study. This thesis, therefore, seeks to give a precise description of the development of his stylistic craftsmanship, and attempts to show that he was in reality the possessor of at least two distinct styles. To accomplish these aims it was found expedient to divide the work into chapters, the first of which indicates the factors motivating the novelist to make certain textual corrections, the results obtained, and the methods employed. In later chapters some of the stylistic aspects in Valle-Inclán--color and contrast, light and darkness, gradation and repetition for effect, appeal to the senses, imagery, etc.--are carefully studied and evaluated.

Valle-Inclán constantly revised his work in an effort to improve his style, and he made excellent use of landscape and weather descriptions to create an atmosphere. His masterful handling of color to depict Nature and everyday objects ranks him as one of the leading colorists of his time. Color contrast in Valle-Inclán, as well as his literary contrasts between light and darkness, silence and sound, happiness and sorrow, humor and seriousness, youth and old age, seem to indicate a conscious and conscientious effort to simulate some of the symmetries of life.

Valle-Inclán also utilizes lyrical words, alliteration, rhythmic sentence patterns, and other stylistic devices to achieve musicality. The rhythmic sentence pattern is unquestionably the most common device employed for this purpose. Perhaps one of Valle-Inclán's chief contributions to Spanish prose is his repetition of exclamatory words or phrases whose rhythm is frequently very beautiful and appropriate to the thought or occasion.

Of all the sensory phenomena in Valle-Inclán's prose fiction--visual, auditory, kinesthetic, tactile, thermic, gustatory, olfactory--sounds appear to have the most extensive variety. The sense most frequently appealed to by Valle-Inclán, however, is sight, if we consider his use of color, light and darkness, gestures, plastic pictures and shadows.

Although there are many commonplace similes and metaphors in Valle-Inclán, there is also an abundance of rich images and other figures of speech, many of which show the influence of preciousness. In addition, Valle-Inclán works with words to obtain beauty of expression, lyricism and cadence, and an atmosphere in which to convey his own moods and feelings. To this end he makes constant use of an aristocratic and exotic vocabulary that stands out for its range and variety, its frequency and its heavy concentration.

Judging from Valle-Inclán's skillful handling of various stylistic techniques, it is evident that he was indeed the author of two distinct styles, the sophisticated art of his early period and the satirical and conversational manner of his later novels. After achieving success with the exquisite and refined prose of his early work, he turned his attention to a style characterized by a staccato-like, telegraphic type of sentence structure and a much stronger, caustic and satirical language. Valle-Inclán may not have always been successful in avoiding monotony, but he obtained many of his most striking effects by an artistic manipulation of his varied stylistic techniques.

Microfilm \$5.80; Xerox \$20.50. 454 pages.

STRUCTURE AND REPETITION IN ELIZABETHAN VERSE

(L. C. Card No. Mic 59-5223)

William O. Scott, Ph.D.
Princeton University, 1959

Handbooks of rhetoric and poetics from classical times through the Renaissance establish definite precepts for the use of various kinds of verbal repetition and explain to the orator or poet the effects intended by each type. In general, there seem to be two purposes behind repetition--transition and emphasis--and each can be related to the temporal development of meaning in language through syntax. Renaissance education concentrated on nuances of style, and because of their training poets of the age would naturally transfer the devices of Latin rhetoric to vernacular poetry; at their best, Renaissance textbooks of rhetoric and poetics represent the traditional feeling for language and syntax which guided the poets in composition.

Four poets provide a good cross-section of techniques of repetition in English Renaissance poetry. Wyatt writes in a simple style and repeats only for the most direct and obvious effects; he evokes an immediate emotional response with the simplest and most evident figures of repetition. Although his individual repetitions do not show any remarkable artistry, he proves his control of larger poetic structure in his use of refrain. By adapting his refrain repetitions to the specific demands of context, he mixes permanence and change in esthetically satisfying proportions.

A different proportion is exhibited in Sidney's poetry. He adjusts repetition and syntax more closely to context, so that syntax becomes imitative of the mind's workings in a given situation. Syntax expresses internal colloquy or meditation. Repetition portrays a mental grasping and seizing upon words for the sake of greater self-knowledge. The mind returns to its own products as material for further operations, and the poem develops organically as a process of self-realization.

Spenser also adapts repetition to context, but he is most concerned to place repetition strategically for transition and modulation in his narrative. The form of his repetition is well adjusted to this purpose: he combines figures masterfully and substitutes within repetitions for a constantly various but restrained development of meaning. Repetition blends into the gentle, langorous flow of his style. Spenser's syntax is conditioned not by a process of introspection as in Sidney but by the narrator's shaping and governing the pace of his story. By syntax, archaism, and stanzaic form he creates a pervasive and unique style which reminds the reader that a single serious moral purpose controls the entire narrative.

Like Sidney, Donne represents the mental processes of an individual in a given situation; but Donne's style and mental cast are radically different from Sidney's. Donne's analytical faculty is directed upon verbal connections; instead of picking up one word to examine it more closely as Sidney does, he suggests obliquely a comparison of meaning in two words of similar sound, form, or etymology. In Donne's argumentative and casuistical style niceties of verbal repetition have a direct and immediate application to verbal meaning. Donne also uses the refrain with key words in corresponding positions in successive stan-

zas; he achieves the strongest possible conflict between an elusive and shifting meaning and rigid stanzaic form.

The extreme flexibility of verbal repetition is evident from its varying uses in the work of these four poets. It can serve a number of esthetic purposes and become a controlling factor in various types of style. It relates to poetic structure through its command over syntactical movement, which necessarily must be fitted into lines and stanzas. The connection of poetic movement with style in general and ultimately with poetic meaning and esthetic effect makes verbal repetition both interesting and significant. Microfilm \$2.90; Xerox \$10.00. 224 pages.

THE BEGINNINGS OF MODERN CRITICISM IN SPAIN, 1750-1800.

(L. C. Card No. Mic 60-366)

John Thomas Siegwart, Ph.D.
Tulane University, 1959

Chairman: Wm. F. Smith

From the middle of the seventeenth century, by which time the issues of the national *comedia* and *gongorismo* had been settled, until 1737, the year in which appeared Ignacio Luzán's *Poética* and the *Diario de los literatos*, there was no notable interest in literary criticism in Spain. Critical writing was introduced by certain literati who sought to change thereby the public's taste and the writer's bent for the extravagant literature of the day which had attracted the scorn of foreign critics. They tried to legislate taste and only occasionally judged literature and then only by neo-classic standards. Except for a few insignificant protests by writers and Feijóo's opinions on esthetics, this was the only criticism afforded literature before 1750.

In the nineteenth century, scholars and critics, having rejected the dogmatism of the neo-classic system, published editions of Spain's past literature and re-evaluated it through the historical method. It was therefore decided to seek evidence of the transition from neo-classical to modern criticism in the last half of the eighteenth century. Representative examples of *aprobaciones*, *censuras*, *prólogos*, and *discursos*, the media of eighteenth century criticism, were obtained on microfilm from the Biblioteca Nacional. Other documents were acquired through inter-library loan and rare book collections in the United States.

An introductory chapter surveyed the course of literary criticism in Spain from the proemio of the Marqués de Santillana through two thirds of the nineteenth century, omitting the eighteenth century, and defined "modern" criticism. This introduction together with the characterization of eighteenth century criticism served as the background against which the changes in critical theory and practice could be recognized.

The censure of foreign critics was responsible for the renewed interest in critical writing. Therefore, foreign influence upon the development of Spanish criticism was studied. The reformers were interested primarily in the drama and it is in dramatic theory that we see the foundations of a modern theory of literature. The apologists for the *comedia* rejected neo-classic standards as the only

criterion of art and merit and, through a logical examination, maintained that art could not be reduced to a rational basis. They sought instead more applicable standards and proposed the historical study of literature.

The historical point of view, which made the re-evaluation of past literature both possible and necessary, was manifested in many ways: through an awakening in the literati of an interest in their literary past and a desire to make it known to the public (the most important effect of foreign criticism); through the attempts to write literary history and through the historical studies of Tomás Antonio Sánchez, Patricio Berguizas, and Pedro Estala.

The foundations of modern literary scholarship were studied in the publications of unedited and little known works of past literature, in the collections of Sedano, Sánchez, Estala, and Capmany, the bibliographies of Sempere and Pellicer, and the many editions of Cerdá y Rico. Erauso y zabaleta was the first to deny neo-classic authority and to propose different standards when he answered Nasarre's prologue in 1750. Because of his *Discurso crítico* and the subsequent changes in the theory and practice of criticism which our study has shown, we may conclude that the beginnings of modern criticism in Spain occurred in the period, 1750-1800.

The appendices include a tentative list of (1) eighteenth century periodicals that contained literary articles, (2) publications of Spain's past literature, and (3) editions and translations of classical literature, and facsimiles of forty-five of the documents studied. The most outstanding examples of modern criticism are included together with other documents representative of all phases of eighteenth century literary criticism.

Microfilm \$15.05; Xerox \$53.80. 1195 pages.

**JAMES HOGG, HIS TALES, POEMS AND SKETCHES:
A CRITICAL STUDY.**

(L. C. Card No. Mic 60-44)

Louis Aston Marantz Simpson, Ph.D.
Columbia University, 1959

The purpose of this study is to examine Hogg's prose in the mass and in detail, to reappraise the verse for which he was once famous, and to remove misapprehensions about the "Ettrick Shepherd." Particular attention is paid to those elements of Scottish pastoral life, tradition, religion and superstition, which Hogg incorporated in his tales and poems.

Organized to prepare the reader for a thorough understanding of Hogg's tales of the supernatural, his most original and important work, the study is in three main parts. The first relates the incidents of Hogg's career and explores those activities which bear directly on his writing: his early life as a shepherd at Ettrick, his self-education, his first attempts in verse and prose, his removal to Edinburgh at the age of forty, and his success as the poet of *The Queen's Wake* and as the original of the "Shepherd", a characterization invented by John Wilson for the "Noctes Ambrosianae" in *Blackwood's Edinburgh Magazine*. Hogg's friendship with Sir Walter Scott is examined, to explain Hogg's frequent, and often unfortunate, attempts to imitate Scott's writings.

The second part deals with Hogg's verse, beginning with his imitations of the ancient ballads, in which are found the germ of his later works in both verse and prose. Analyses of "The Witch of Fife" and "The Pedlar" show Hogg's originality in rendering the *physique* of the supernatural. His songs--several of which have passed into folklore, his narrative poems, and *The Poetic Mirror*, a book of parodies, are then discussed. Hogg was a poet of fancy, who rarely found the right form and subject, but his successful poems are verse of a high order.

In the third part, the prose tales and sketches are examined. First, Hogg's technique and style are analyzed. The pastoral writings, representing the life that Hogg knew at first hand, are compared with his excursions into the picaresque and marvellous. There follows a discussion of his traditional tales and historical romances. When Hogg takes his materials from folklore and hearsay, or from the history of the Covenanters, whose legends still animate Scottish life, he is a convincing story-teller; when he attempts romance in the manner of Scott, he fails.

Hogg's original use of superstition in his tales is examined preparatory to a discussion of his powerful novel, *The Private Memoirs and Confessions of a Justified Sinner*. The genesis of this work was a controversy over antinomianism that divided the Scottish Church in the early eighteenth century--a matter, as this study shows, of which Hogg was informed through local tradition. Following the analysis of the novel, the hypothesis that J. G. Lockhart helped Hogg in composing it is considered and shown to have no foundation.

The study concludes with a survey of Hogg's characteristics: his lack of critical standards, his superstition, his Presbyterianism, and the contradictions of belief that led to divisions in his life and work. There are two appendices: a chronological list of Hogg's prose publications, and specimens of the conversation of the "Shepherd" of the "Noctes Ambrosianae."

Microfilm \$4.40; Xerox \$15.55. 343 pages.

**ELIZABETH MADOX ROBERTS:
A BIOGRAPHICAL AND CRITICAL STUDY.**

(L. C. Card No. Mic 60-705)

Woodridge Spears, Ph.D.
University of Kentucky, 1953

The purpose of this study is to trace the growth of Miss Roberts as a literary artist.

As an artist Miss Roberts was strongly influenced by patterns of time, place, and family. She was of Irish, Welsh, and Germanic stock, her forebears having settled in Maryland and Virginia and having come later along the Wilderness Road into Kentucky. Her mother's grandfather, Valentine Garvin, had been a teacher, and, as a member of the General Assembly of Kentucky, he had worked to improve the schools. Her father, Simpson Roberts, an ex-Confederate, was a teacher, school superintendent, surveyor, and merchant. Her mother, Mary Elizabeth Brent, a daughter of a Union soldier, was a practical woman of strong will.

Born at Perryville, Boyle County, Kentucky, on October 30, 1881, Elizabeth was the second of the eight children of

the Roberts family. As a child in Springfield she became accustomed to a community in which family and neighborhood associations were close and the social conventions strong. She completed her high school courses at Covington, Kentucky, in June, 1900.

Instead of going to college she turned to teaching, and in her teaching at Springfield and in the rural schools of Washington County she saw aspects of life that influenced her writing. Her health gave way, and in 1910 she went to Larkspur, Colorado, where she rested and resumed her writing.

From childhood she had been writing poetry, but when she came to Lexington in 1913, she brought some versis in the vein of those which would appear in her first book, *In the Great Steep's Garden*.

Publication of her verse in *Idea*, *Sunset Magazine*, and *The Kentucky High School Quarterly* were followed by publications in student magazines at the University of Chicago. On the Chicago campus she had the stimulation afforded by membership in the Poetry Club. By the time *The Atlantic Monthly* published her work in 1921, she had developed a distinctive style to fit the subject matter which she knew best. She appraised her work and concluded that her method was fit for poetic realism, satire, and fantasy.

Her progress was striking. Her first, second and third books showed definite improvement in the application of method. The first was a group of poems unified by the theme of a spiritual progress or journey, a modern tour. *Under the Tree*, published in 1922, was a unified and complete record of life as seen by a little girl. The third book, *The Time of Man*, similar in method to *Under the Tree*, may be said to date from 1919 although the work was composed during a four-year period ending in 1926. The verse of the second book had changed to the long, rhythmic lines of a poetic prose charged with intimate knowledge of the matter and with genuine feeling. Miss Roberts had succeeded as a poet-novelist.

Other prose works followed, and from the publication of *The Time of Man* in 1926 until her death, March 13, 1941, writing and health were prime considerations with Miss Roberts. Four novels appeared in rapid succession: *My Heart and My Flesh* (1927), *Jingling in the Wind* (1928), *The Great Meadow* (1930), and *A Buried Treasure* (1931).

In 1932 the line of novels was broken by a collection of short stories, *The Haunted Mirror*. *He Sent Forth a Raven*, published in 1935, and *Black Is My True Love's Hair*, published in 1938, are both novels. In 1940 came *Song in the Meadow*, a book which contains some of her best verse. *Not by Strange Gods*, published in 1941, was her second book of short stories.

Her best works were produced early: *Under the Tree*, *The Time of Man*, and *The Great Meadow*. Yet the works after 1930 are significantly good.

Microfilm \$3.60; Xerox \$12.60. 278 pages.

THE ENGLISHWOMAN IN FRENCH FICTION, 1870-1914.

(L. C. Card No. Mic 60-523)

Enid Mary Standring, Ph.D.
New York University, 1957

Adviser: Richard A. Parker

The aim of this study was, first, to determine the rôle of the Englishwoman in French fiction of the 19th Century; secondly, to establish whether the fictional Englishwoman is usually juxtaposed to a Frenchwoman and her national traits emphasized in contrast to those of the latter.

Thirdly, we were interested in examining the techniques employed to render these traits convincing, and also whether French authors were capable of distinguishing between Englishwomen, Irishwomen and Scotswomen. Finally, we hoped to determine to what extent these portrayals of Englishwomen revealed the French writers' view of English character and their concept of various aspects of English life and institutions.

Our Introduction analyzes the English women characters who appear in French fiction between Mme. de Staël's *Corinne* (1807) and Edmond About's *Le Fella* (1869). Our conclusion regarding the fictional Englishwoman of this period is that she presents a fairly homogeneous picture. The English wife and mother is dutiful, devoted and chaste. The ingénue is beautiful, cultured and intelligent, inspiring in the opposite sex the deepest respect. The English spinster, however, is prudish and eccentric.

In the main part of the thesis, we have studied five authors who, owing to the number of importance of their fictional Englishwomen were considered to merit separate chapters: Alphonse Daudet, Anatole France, Guy de Maupassant, Paul Bourget and J.-H. Rosny. The life of each author was examined in order to determine whether his figures of Englishwomen were based on prototypes observed in England or abroad, or were literary creations inspired by his reading of English writers, or were figments of his imagination.

Alphonse Daudet, who did not know English, used Englishwomen mainly as incidental characters, basing their portraits on tourists observed in France or abroad. Exceptionally, a half-English ingénue in *Sapho* (1884) plays the rôle of counter-figure to the French heroine and brings about the dénouement.

Anatole France, who also knew no English and who visited England only once, introduced even fewer Englishwomen into his fiction. However, in *Le Lys rouge* (1894) appears the most complex and interesting fictional Englishwoman of this period: Vivian Bell. As a poetess, she is the only character to continue the tradition of Mme. de Staël's *Corinne*. Moreover, in her function as counter-figure to the Parisian heroine, she is the most striking case of juxtaposition of an Englishwoman to a Frenchwoman in the fiction of this epoch.

Maupassant, a confirmed Anglophobe, who made only one short trip to England, introduced no Englishwomen into his novels. Those appearing in his short stories may be classified into two types: the caricatural, buck-toothed type, represented by Miss Harriet, and the Blond, blue-eyed, idealized type set by the heroines of "Découverte" and "L'Epave." By certain spelling devices, Maupassant

has succeeded in burlesquing the spoken French of his English women characters.

The numerous Englishwomen appearing in the fiction of Taine's disciple, Paul Bourget, reflect the author's Anglomania. The majority of them are of noble birth, robust, active and beautiful, and all are characterized by candidness and loyalty. We may classify them into four types: the romantic, the practical, the romantic-practical, and the enigmatic, characterized by a dualism of personality. Furthermore, in Bourget's *nouvelle*, *Neptunevale*, appears a strikingly typical Irishwoman, Aunt Harriet.

Our last chapter analyzes the fictional Englishwomen of J.-H. Rosny aîné, who lived and worked for eleven years in England and married a London girl from the lower working-class. It is not surprising, then, that we find in his fiction Englishwomen mainly from the working-class realistically depicted in their own environment. Rosny's works on England are characterized by an extensive use of Anglicisms, by which he endeavors to render in French the effect of the Cockney idiom.

Interesting figures of Englishwomen who appear in works by authors other than those analyzed in our five chapters are briefly studied in our Conclusion and listed in our Repertory of English Women Characters.

Though a composite picture of the fictional Englishwoman is easily formed for the period before 1870, the complexity of her personality and the variety of social classes in which she is depicted after 1870 make any generalizations as to her character and appearance well-nigh impossible. The realism achieved by this diversity is furthermore enhanced by the more profound knowledge of English society and institutions displayed by the later writers. Microfilm \$4.60; Xerox \$16.20. 360 pages.

A CRITICAL HISTORY OF THE PULITZER PRIZE NOVELS, 1917-1947.

(L. C. Card No. Mic 59-6944)

William Joseph Stuckey, Ph.D.
Washington University, 1959

Chairman: Guy A. Cardwell

Although the Pulitzer novel prize is the most popularly known literary award in the United States, a survey of serious criticism revealed that the prize has been held in low esteem for many years because, it is usually said, the most significant novels have been regularly ignored. This is a charge which the records quickly substantiated. About the winning novels, however, the critics said little, except that they were "safe" and popular. The primary purpose of this study, therefore, was to analyze critically the Pulitzer Prize novels (1917-1947) in order to determine their themes and to estimate their intellectual and artistic values. It was also the purpose of this study to discover how, by whom, and on what basis the prize-winning works were selected.

Research revealed that the "idealistic" terms set down

by Pulitzer (for the novel which "shall best present the highest standard of American manners and manhood") were modified five times, the "idealism" being abandoned in 1931. And though the prizes were ostensibly awarded by the Trustees of Columbia University after "nomination" by the Advisory Board of the Graduate Journalism School, the prize-winning novels were usually selected by juries from the American Academy and the National Institute of Arts and Letters. The author was able to identify only ten of these jurors (all of whom served between 1920-1934) and, of these, a majority were disposed to favor social "up-lift" novels.

Analysis of the prize-novels revealed a fairly consistent preference for currently popular "conservative" political, social, and economic themes. During the first decade, the Pulitzer authorities favored novels that equated personal morality with economic individualism, and favorably contrasted "rugged" individualists with unaggressive weaklings. During the second decade (the 1930 depression years), several Pulitzer novels extolled a less "rugged" individualism (personal morality being equated simply with hard work), but the major emphasis in the second decade was on themes of sex and marriage. Personal morality in some books was equated with a woman's ability to dally with but not to fall into adultery. During the third decade, there was a preference for both themes, though the authorities also chose novels that dealt sentimentally with World War II. The award to *All the King's Men* in 1947 was ironic as well as unique, since Warren attacked the kind of "historical morality" which many of the prize novelists had used to underpin their simple-minded economic and sociological themes: that certain actions or conditions are right, not in themselves, but because they have come to pass.

Analysis of the artistic qualities of the prize novels showed that with some notable exceptions they were sub-literary works, pitched to about the same intellectual and emotional level as the ordinary movie or radio "soap opera." The ideas were usually trivial, the characters crudely drawn stereotypes artlessly manipulated to illustrate the theme or carry out the plot. There were usually wide gaps between what was asserted and what was created artistically. The styles were usually "journalistic," varying within a single novel from the high-flown "literary" manner to the insensitive bullying tone which elbows aside unpopular or difficult intellectual or moral considerations. Judging from the fact that the Pulitzer Prize never went to a first rate novel, that with certain exceptions it went to mediocre, poor, and to one or two exceptionally bad novels, it was concluded that the Pulitzer novel prize, more often than not, was a badge of mediocrity.

Microfilm \$3.40; Xerox \$11.95. 263 pages.

THE AESTHETIC THEORY OF
HENRY DAVID THOREAU

(L. C. Card No. Mic 60-49)

Wade Clayton Thompson, Ph.D.
Columbia University, 1959

The intention of this essay is:

(a) To present in a coherent and systematic form that body of speculation concerning the nature of art, particularly literary art, which may be termed the Aesthetic Theory of Henry David Thoreau. Thoreau himself made no effort to give his aesthetic theory a unified or formal presentation. Possibly he felt that such a task would be useless--perhaps even impossible. For whatever reason, his theory--to the extent that he articulated it--lies scattered indiscriminately throughout his journals and his works.

(b) To infer from an analysis of his works what his theory might have been in areas where there is little or no explicit statement. Thus Thoreau said relatively little about the need for "form" in literary creation--indeed he seemed, in theory, more determined to deny the necessity for form than to affirm it. Yet an analysis of *Walden*, and a comparison of *Walden* with *A Week*, clearly indicate that by 1854 Thoreau was thoroughly convinced of the need for form, and had worked long and seriously to achieve it.

(c) To relate Thoreau's theory to the theories of other men of his time, and to indicate the nature of his independent speculations. For this purpose I have attempted to place his more derivative thinking in the first three chapters, and his more independent thinking in the last three.

(d) To evaluate the adequacy of his theories in relation to each other and in relation to his works. Clearly Thoreau was by no means a consistent thinker; his theories do not always comprehend his practice, and sometimes his practice clearly contradicts his theories. His speculations about humor, for example, are sometimes wildly at odds with the undeniable humor which pervades most of his writings.

(e) Finally, to show how and to what extent Thoreau's aesthetic theory is realized in his writings and in his life. For this purpose I have used only such writings as seem to me most appropriate for illustrative purposes. I have made no effort to include all of Thoreau's works, but have concentrated chiefly on *Walden*, because, it seems to me, *Walden* constitutes the greatest fulfillment of the Aesthetic Theory.

Chapter One, entitled Art and Inspiration, deals with the doctrine and the fact of inspiration as Thoreau conceived of them. Chapter Two, Art and Nature, is concerned with the transmutation of nature into art, and the problems which such transmutation involves. Chapter Three, Art and the Artist, presents the organic relation between the artist and his work--a relation which is realized primarily in terms of the artist's moral sense and self-knowledge.

Chapter Four concerns Thoreau's style and his theories about the nature of style. Chapter Five is an explication of Thoreau's theory of "mythology," and the application of that theory to his essays. Chapter Six is a presentation of the theory of organic form--as Thoreau conceived it--and a discussion of its fulfillment in *Walden*.

Microfilm \$2.50; Xerox \$8.00. 173 pages.

THE CLASSIFICATION OF SINGULARITIES OF CURVES
BY MEANS OF THEIR COMPLETE LOCAL RINGS

(L. C. Card No. Mic 60-427)

Sherwood Forrest Ebey, Ph.D.
Northwestern University, 1959

To each singular point P of an algebraic curve C there is associated the local ring of C at P and the completion of this local ring (which is called the complete local ring at P). One way to approach the problem of classification of singular points is to consider as equivalent all singular points whose complete local rings are isomorphic. The problem of this thesis is to carry through such a program of classification.

We restrict ourselves to "one-branch" singularities. For this case each complete local ring can be identified with a complete subring of the formal power series ring $\Omega\{t\}$, where Ω is the universal domain. Our main result is that systems of representative generators for these complete local rings can be found. By this we mean that any complete local ring of a particular class (determined by numerical invariants) is isomorphic to one and only one ring with generators that are in the system of representative generators for this class of rings. Moreover the systems of representative generators are parametrized by the points of certain "algebraic" subsets of an affine space. Precisely these "algebraic" sets are the finite union of subsets that are locally closed (intersection of an open and closed subset in the Zariski topology).

The method used is to apply the theory of algebraic groups and transformation spaces. The group G of Ω -automorphisms of $\Omega\{t\}$ is the group of automorphisms of the form

$$t \rightarrow a_0 t + a_1 t^2 + \dots, a_0 \neq 0.$$

By taking this group modulo an appropriate subgroup, we obtain a solvable connected algebraic group. We represent each ring of a particular class by a set of generators. The coefficients of the various powers of t in these generators correspond to a point of some affine space. The operation of G on the given class of rings can be translated into the rational operation of a solvable connected algebraic group on an affine space. Then we use the existence of a cross-section [cf. 1, Theorem 10] to obtain the result.

We give a second proof (restricted to characteristic $= 0$) which yields a method of constructing such representative generators. Also we consider a special case in which one component of the system of representatives is proved to be an affine space minus a proper closed subset.

We consider also "multiple-branch" singularities and show that our particular approach fails for this more general situation because the algebraic groups that occur are not connected.

In an appendix we prove that for characteristic $= 0$ any rational operation of the additive group of Ω on the affine plane is given by

$$(t, x, y) \rightarrow (x, y + tf(x)), f(x) \in \Omega[x]$$

after a suitable change of coordinates in the plane.

REFERENCE

- [1] M. Rosenlicht, "Some Basic Theorems on Algebraic Groups," *American Journal of Mathematics*, vol. 78 (1956), pp. 401-443.
Microfilm \$2.50; Xerox \$5.20. 103 pages.

MILLS' RATIO AND LINEAR TRUNCATION
FOR SOME PEARSON CURVES

(L. C. Card No. Mic 60-332)

William E. Felling, Ph.D.
St. Louis University, 1959

Any statistical distribution is completely determined when the parameters of the distribution are known. The determination of these parameters, when some variates are deliberately excluded from the sample population, presents an interesting problem in statistical point estimation. The author has developed estimate equations of the parent population parameters when samples are assumed taken from a Beta distribution, and the sample has been truncated on either or both tails of the distribution. The estimate equations are developed using methods of maximum likelihood. Since these equations involve Mills' Ratio of truncated area to bounding ordinates, the use of continued fractions is employed to obtain bounds on this ratio. These bounds are obtained from approximants to the continued fractions and the use of successively higher ordered approximants increases the accuracy of the bounds as estimates of Mills' Ratio. The information matrix is developed for a doubly truncated sample taken from a Beta distribution. Microfilm \$2.50; Xerox \$4.00. 72 pages.

ON A CERTAIN CLASS OF OPERATOR ALGEBRAS

(L. C. Card No. Mic 60-15)

James G. Glimm, Ph.D.
Columbia University, 1959

In this paper we study the class of C^* -algebras, each member of which contains a dense strictly ascending sequence of full $n \times n$ ($n < \infty$) complex matrix algebras. We call these algebras uniformly hyperfinite. Factors of type Π_1 which are the weak closure of such a sequence were first studied in F. Murray and J. von Neumann, *On rings of operators*, IV, *Ann. of Math.*, vol. 44 (1943), pp. 716-808. There it was proved that all such factors are isomorphic. The algebras we study are not all isomorphic, we classify them according to algebraic type. We identify the pure states and the pure state space of uniformly hyperfinite algebras. The w^* -closure of the pure states of one of these algebras is the set of all states of the algebra. This

is not the first example of a C^* -algebra whose set of pure states is not closed, of H. Yoshizawa, Some remarks on unitary representations of the free group, Osaka Math. J., vol. 3 (1951), pp. 55-63. We classify the irreducible representations of uniformly hyperfinite algebras according to unitary equivalence, and we study certain other representations of these algebras.

Microfilm \$2.50; Xerox \$3.00. 40 pages.

DEVELOPMENTS TOWARD A SERIES SOLUTION OF THE MAXWELL-BOLTZMANN EQUATION

(L. C. Card No. Mic 60-131)

David Edsel Johnson, Ph.D.
Alabama Polytechnic Institute, 1958

Supervisor: Ernest Ikenberry

Developments toward an exact series solution of the linearized Maxwell-Boltzmann equation, for charged particles in an electromagnetic field, are given. The collision integral is linearized and given in the standard form of Chapman and Enskog by a method which utilizes only the Boltzmann collision diagram and properties of the transcendental functions involved. It is shown that the eigenfunctions of the linearized collision operator for Maxwellian molecules are products of solid spherical harmonics and certain Sonine polynomials. The method of obtaining the eigenfunctions and the eigenvalues differs from Wang Chang and Uhlenbeck's method ("On the Propagation of Sound in Monatomic Gases," U. of Mich. Eng. Res. Inst. Report, Oct., 1952) by avoiding the use of series expansions.

The distribution function is expressed as a series of the eigenfunctions, and the differential equations for the expansion coefficients are obtained by substituting this series into the Maxwell-Boltzmann equation. Special cases of these equations are shown to be the well-known equations of continuity, of motion, and of energy.

Microfilm \$2.50; Xerox \$4.20. 80 pages.

SEQUENCE SPACES AND SUMMABILITY OVER FIELDS WITH NON-ARCHIMEDEAN VALUATIONS

(L. C. Card No. Mic 59-6964)

Carl Elwood Kerr, Ph.D.
Lehigh University, 1959

Let F be a field which is complete with respect to a non-archimedean valuation $|\cdot|$. Following the classical definitions the normed linear spaces E^n , E^∞ , ℓ^p (with p a positive integer), c_0 , c and m are defined over F .

In chapter 1 it is shown that i) m is the conjugate space of ℓ^q , c_0 and c ; ii) the conjugate space of m may be looked upon as the set of Stieltjes integrals $\int x d\alpha$, where $x \in m$ and α is a bounded additive set function defined on the subsets of the positive integers and iii) s , the space of all sequences over F , with the weak topology is reflexive.

In chapter 2 the main results have the form: the matrix A transforms $H_1 \subset s$ into $H_2 \subset s$ if and only if A has

properties P_1, P_2, \dots, P_n . H_1 and H_2 are sequence spaces c, c_0, m, s or T where $T = \{x \in s \mid \lim_i |x_i| = \infty\}$. For example:

T 2.4 The matrix A maps m into c if and only if A maps c into c and the series of row-sums $\sum_k a_{nk}$ is uniformly convergent with respect to n .

T 2.13 The matrix A maps s into c if and only if i) $\lim_n a_{nk}$ exists for $k=1,2,3,\dots$, ii) A is right finite, i.e. there exists an integer K such that if $k > K$ then $a_{nk} = 0$ for $n = 1,2,3,\dots$.

T 2.15 Let A be a matrix which satisfies the condition $\sup_{i,j} |a_{ij}| < \infty$. Then A maps T into T if and only if a) the rows of A are in E^∞ ; b) there is a sequence of elements $a_{1t_1}, a_{2t_2}, \dots, a_{nt_n}, \dots$ which satisfies the following conditions: i) there exist a positive integer M and a positive real number r such that $n > M$ implies $|a_{nt_n}| \geq r$ and ii) $\lim_n t_n = \infty$; c) there is an integer K such that for $t > K$, $a_{nt} = 0$ for $n=1,2,3,\dots$ except for the a_{nt_n} mentioned in b).

In the first part of chapter 3 an analogue to the Minkowski functional is given in D 3.2. Let \mathcal{L} be a linear space over F and let $K \subset \mathcal{L}$ satisfy the conditions: i) $a \in K$ and $b \in K$ implies $(\alpha a + \beta b) \in K$ whenever $|\alpha| \leq 1$ and $|\beta| \leq 1$, ii) K is absorbing. Subsets of \mathcal{L} which satisfy i) and ii) are called M -sets. Then $P(a) = \inf \frac{1}{|\lambda|}$ for all λ such that $\lambda a \in K$ is called the gauge function of K . Then it is shown that there is a one-to-one correspondence between M -sets in \mathcal{L} and gauge functions on \mathcal{L} . Further, a seminorm $\| \cdot \|$ on \mathcal{L} which satisfies $\|a+b\| \leq \max(\|a\|, \|b\|)$ is equivalent to a seminorm defined by the gauge function of the unit disk in \mathcal{L} . There are some seminorms which are not equivalent to any gauge function, e.g. the norm of ℓ^1 , $\|x\| = \sum_{i=1}^{\infty} |x_i|$.

In the last part of chapter 3 analogues to some classical Mazur theorems are deduced and an analogue to the function $\chi(A) = \lim_{i=1}^{\infty} A^i - \sum_{i=1}^{\infty} \lim_{A} \delta^r$ is discussed.

Microfilm \$2.50; Xerox \$6.00. 125 pages.

IMBEDDING OF COMPACT METRIC SPACES IN CUBES

(L. C. Card No. Mic 60-267)

Nosup Kwak, Ph.D.
Duke University, 1959

Supervisor: John H. Roberts

This thesis grew from an attempt to settle the following unsolved problem for the case where the k -dimensional set X is compact: "It is not known whether there exists any k -dimensional subset of E_n containing a topological image of every k -dimensional subset of E_n when $n < 2k + 1$."

Now if $n \geq 2k + 1$ it is known that the set of all homeomorphisms of a compact k -dimensional space X into M_n^k

(the set of points in I_n having at most k rational coordinates) is a dense G_δ -set in the set $H(X, I_n)$ of all homeomorphisms of X into I_n , the n -dimensional cube in Euclidean n -space E_n . Using this as a model, we formulate the following proposition.

(P): Suppose X is compact and $\dim X = k$. Then the set of homeomorphisms such that $f(X) \subset M_n^k$ is a dense G_δ -set in the set $H(X, I_n)$ of all homeomorphisms of X into I_n .

Proposition (P), which if true would give an affirmative answer to the original problem, is known to be true, in case $n < 2k+1$, only for the special cases where $k \geq n-2$. However, attempts to solve it lead to related propositions and we obtain the following theorem that all these propositions are equivalent to (P).

Theorem. Let X be a k -dimensional compact space and $k \leq n$. The following are equivalent:

(1) The set of homeomorphisms $\{f\}$ such that $f(X) \subset M_n^k$ is a dense G_δ -set in $H(X, I_n)$.

(2) The set of homeomorphisms $\{f\}$ such that $m_{k+1} f(X) = 0$ is a dense G_δ -set in $H(X, I_n)$.

(3) Let a rational $(k+1)$ -plane R_{k+1} be given. The set of homeomorphisms $\{f\}$ such that $\dim (P \circ f)(X) \leq k$ is a dense G_δ -set in $H(X, I_n)$, where P is the orthogonal projection onto R_{k+1} .

(4) Let a countable family of $(n-k-1)$ -planes be given. The set of homeomorphisms $\{f\}$ such that

i) $\dim (f(X) \cap I_q) \leq k+q-n$ for any q -plane I_q , $n-k \leq q \leq n$, and

ii) $f(x) \cap I_{n-k-1} = \emptyset$ for any $(n-k-1)$ -plane I_{n-k-1} of the given family,

is a dense G_δ -set in $H(X, I_n)$.

Microfilm \$2.50; Xerox \$3.00. 33 pages.

ON MIXED BOUNDARY VALUE PROBLEMS FOR ELLIPTIC EQUATIONS IN THE PLANE

(L. C. Card No. Mic 60-509)

Eric Liban, Ph.D.

New York University, 1957

Adviser: Professor L. Nirenberg

The paper deals with the elliptic system of first order equations, written in complex form

$$w_z = aw + b\bar{w}, \quad |z| < 1$$

and the uniformly elliptic second order equations

$$\varphi_{xx} + \varphi_{yy} + A_1 \varphi_x + A_2 \varphi_y = B$$

and

$$A_{11} \varphi_{xx} + 2A_{12} \varphi_{xy} + A_{22} \varphi_{yy} + A_1 \varphi_x + A_2 \varphi_y = B$$

in a simply connected domain. The coefficients of the second order terms are continuous functions of x and y , possessing Hölder continuous first derivatives. The following mixed boundary conditions are considered: a directional derivative of φ is given on the boundary and the value of φ itself is prescribed at properly located points on the boundary. For the first order system equivalent boundary conditions are stated.

The author obtains a priori estimates of solutions of linear equations, satisfying mixed boundary conditions, without making any continuity assumptions on the coefficients other than the one stated above; they depend only on the bounds of the coefficients and the prescribed boundary conditions. These estimates enable him to show the existence and uniqueness of solutions of linear equations and permit him also to prove, by topological methods, the existence of solutions of non-linear equations.

Microfilm \$2.50; Xerox \$3.00. 55 pages.

FIXED POINT THEOREM FOR A CONTRACTION MAPPING IN A REGULAR DEVELOPABLE SPACE

(L. C. Card No. Mic 60-581)

Jerold Chase Mathews, Ph.D.

Iowa State University of Science and Technology, 1959

Supervisor: Henry P. Thielman

Kolmogorov and Fomin in their book *Elements of the Theory of Functions and Functional Analysis, Vol. I*, prove the following theorem: If X is a complete metric space then every contraction mapping in X has a unique fixed point. They also prove, using one of the classical techniques, that every metric space can be completed. The present dissertation establishes that these two results may be generalized to a class of non-metrizable spaces; namely, to a subclass of the class of all developable topological spaces. The remainder of this abstract is devoted to a more detailed account of this generalization.

Let (X, T) have a development G_1, G_2, \dots , and let the elements of G_i be denoted by U_i^a , where a is an index; then a mapping $f: X \rightarrow X$ is called a (p, G) -contraction mapping if and only if (1) there exists a positive integer p such that for all n and all a , $f(U_n^a) \subset U_{n+p}^b$ for some b , and (2) there exists an x_0 in X and a positive integer N such that x_0 and $f(x_0)$ are both in U_N^b for some b . A G -chain is

any sequence $\{U_i^{a_i}\}$ such that $U_i^{a_i} \cap U_{i+1}^{a_{i+1}} \neq \emptyset$. A G -Cauchy sequence in X is any sequence $\{x_i\}$ such that a G -chain $\{U_i^{a_i}\}$ can be found together with an N such that for $q = 1, 2, \dots$, it is true that x_{N+q} and x_{N+q+1} are both members of $U_{m(q)}^{a_{m(q)}}$, where $\{m(i)\}$ is a subsequence of $\{i\}$. The space

(X, T) is said to be G -complete if and only if each G -Cauchy sequence converges. The result that parallels that of Kolmogorov and Fomin may be stated as follows: If (X, T) is a space having a development G and which is G -complete, then each (p, G) -contraction mapping has a fixed point. A weakened form of uniqueness is also established.

The second part of this dissertation is concerned with establishing that certain developable spaces may be completed. A G -chain $\{U_i^{a_i}\}$ is said to converge if and only if there exists a nested sequence $\{U_{m(i)}^{b_{m(i)}}\}$ such that (1) each entry of $\{U_{m(i)}^{b_{m(i)}}\}$ eventually contains the entries of $\{U_i^{a_i}\}$ and (2) $\bar{U}_{m(i+1)}^{b_{m(i+1)}} \subset U_{m(i)}^{b_{m(i)}}$. A developable topological space is said to have a convergent development if and only if (1) each G -chain converges and (2) each nested sequence $\{U_{m(i)}^{b_{m(i)}}\}$ is such that $\cap \{U_{m(i)}^{b_{m(i)}} : i \in I^+\}$ contains at most one element. It is shown that such a space is regular, T_1 , and may be completed.

Finally, in the dissertation are given several examples of non-metrizable spaces which have convergent developments. Microfilm \$2.50; Xerox \$3.00. 35 pages.

AN EXPERIMENTAL COMPARISON
OF TWO METHODS OF TEACHING PER CENT
TO SEVENTH GRADE PUPILS

(L. C. Card No. Mic 59-6389)

Della Lorraine McMahon, Ed.D.
University of Missouri, 1959

Supervisor: Ralph K. Watkins

Purpose: To compare initial learning and retention of learning if seventh grade pupils are taught per cent by the ratio method or the conventional method.

Method of Research: 245 seventh grade pupils in two public schools in Waterloo, Iowa, were subjects of the study. Four middle ability classes and one low ability class were taught per cent by the ratio method, and an equal number of classes were taught by the conventional method. At the end of the five week teaching period a final per cent test constructed by the investigator was administered to all subjects of the study. Six weeks later a retention test was administered.

Summary:

- (1) There was no significant difference between the middle ability groups taught by the two methods on the total final test.
- (2) A difference significant at the .05 level, in favor of the classes taught by the ratio method, was found on the computation sub-test.
- (3) No significant difference between the groups was found in the results of the test of interpretation of statements about per cent.
- (4) The results of the problem solving test were inconclusive, as there was a significant difference between the groups in one school and no significant difference in the other school.
- (5) There was significant difference between the low ability classes on the total final test or any of its sub-tests.
- (6) On the retention test, there were differences, significant at the .01 level in one school and the .05 level in the other school, on the total test in the middle ability classes. The classes taught by the ratio method had higher mean scores in both schools.
- (7) There was a highly significant difference between the groups, in favor of classes taught by the ratio method, on the computation retention test.
- (8) There were no significant differences between the groups on the interpretation test and the problem solving test.
- (9) There were no significant differences between the low ability classes on the total retention test or any of its sub-tests.

Conclusions:

- (1) There seems to be no difference in the ratio and conventional methods in developing ability to interpret statements about per cent.

(2) The ratio method of teaching per cent results in greater skill in computation involving per cent than does the conventional method.

(3) The ratio method of teaching per cent results in more permanent learning than does the conventional method.

(4) Neither the ratio method nor the conventional method is successful in teaching per cent to pupils of low ability. Microfilm \$2.50; Xerox \$7.60. 161 pages.

COMBINED INTRABLOCK
AND INTERBLOCK ESTIMATES

(L. C. Card No. Mic 60-773)

Manavazhi Vijaya Krishna Menon, Ph.D.
The Ohio State University, 1959

In the combined intra- and inter- block estimate of a 'variety,' there occurs the quantity θ which is the ratio of the interblock variance to the intrablock variance. θ is usually unknown and has to be estimated. This study deals principally with certain limit theorems which hold when θ is replaced by a consistent estimate θ^* .

It is assumed throughout that all incomplete block designs used have equal block sizes and that the intrablock normal equations for the varietal effects have unique solutions. Let $y_{ij} = \mu + v_i + b_j + \epsilon_{ij}$ be the observation associated with the i^{th} variety in the j^{th} block. Here μ is the general mean, v_i is the effect of the i^{th} variety, and b_j is the effect of the j^{th} block. b_j is distributed $N(0, \sigma^2)$, ϵ_{ij} is distributed $N(0, \sigma^2)$, and the b_j and the ϵ_{ij} are mutually independent. The observations y_{ij} can be replaced by certain linear combinations $x_\alpha, \alpha = 1, \dots, r; z_\alpha, \alpha = r+1, \dots, n; y_\alpha, \alpha = 1, \dots, s; t_\alpha, \alpha = s+1, \dots, m$, such that any linear combination of the observations orthogonal to the mean can be expressed as a linear combination of the $x_\alpha, y_\alpha, z_\alpha$, and t_α . If S_α is a linear form in the varietal effects, then this reduction provides a systematic way of getting the combined intrablock and interblock estimate \hat{S}_α and also of estimating θ , besides being used in the proof of the limit theorems given below.

Let S_α^* be obtained from \hat{S}_α by replacing θ by θ^* . Assuming that there exists a sequence of designs for which $\theta^* - \theta$ in probability and $m, n, \dots \rightarrow \infty$, we have the following theorems:

Theorem 1. $\text{plim} \frac{\hat{S}_\alpha - S_\alpha^*}{\sigma_{\hat{S}_\alpha}} = 0$.

Theorem 2. The ratio of the difference between the end points of the confidence interval $|\hat{S}_\alpha - S_\alpha| \leq \eta \sigma_{\hat{S}_\alpha}$ and the confidence interval $|S_\alpha^* - S_\alpha| \leq \eta \bar{\sigma}^*$ to the length of the former interval approaches in probability the limit 0, where $\bar{\sigma}^*$ is obtained from $\sigma_{\hat{S}_\alpha}$ by replacing θ by θ^* and by any consistent estimate σ^* .

Theorem 3. If $P(|\hat{S}_\alpha - S_\alpha| \leq \eta \sigma_{\hat{S}_\alpha}) = \beta$, then $P(|S_\alpha^* - S_\alpha| \leq \eta \bar{\sigma}^*) = \beta$.

Theorem 4. $\text{plim} \frac{\hat{v}_i - v_i^*}{\sigma_{\hat{v}_i}} = 0$, where if $v_i = \sum c_{i\alpha} S_\alpha$, then $v_i^* = \sum c_{i\alpha} S_\alpha^*$, and $\hat{v}_i = \sum c_{i\alpha} \hat{S}_\alpha$.

It is also shown that the maximum likelihood method, the method employed by C. R. Rao in 'General Methods of Analysis of Incomplete Block Designs' J.A.S.A., 1947, and the method employed in this study for estimating the S_α are equivalent. The estimate \hat{S}_α is the best unbiased linear estimate of S_α .

If v_α^* denotes the best unbiased linear combination of the intrablock and the interblock estimates of v_α , and $\hat{v}_\alpha = \sum c_{i\alpha} \hat{S}_\alpha$ is the combined intrablock and interblock estimate, then $v_\alpha^* = \hat{v}_\alpha$ for all α if and only if the incomplete block design is balanced.

Finally, if θ^* is any estimate of θ , which is independent of x_α and y_α , then $E(S_\alpha^*) = S_\alpha$, and an expression is obtained for the variance of S_α^* .

Microfilm \$2.50; Xerox \$3.00. 52 pages.

ON REGRESSION FOR A COMPOUND BIVARIATE SURFACE

(L. C. Card No. Mic 60-684)

Cordell Bridges Moore, Ph.D.
University of Kentucky, 1953

This study was undertaken due to the ever present interest in regression and in particular because of the rapidly increasing importance of the characteristics of compound bivariate distributions in the field of industry. The purpose was to develop formal expressions and study various properties of regression for a compound bivariate distribution consisting of two normal components, and also when samples are drawn from such a distribution.

First in Section II, an expression is obtained in terms of moments for the regression of any power of y on x for $F(x,y) = pf_1(x,y) + qf_2(x,y)$ where f_1 and f_2 are normal and $p + q = 1$. A similar expression in terms of seminvariants was developed in Section III. In Section IV the regression of the mean and of the variance in terms of seminvariants were obtained where f_1 and f_2 were non-normal.

Sections V-VIII were concerned with various regressions where N_1 samples were drawn from the first component and N_2 samples from the second such that $N_1 + N_2 = N$. Formal expressions were obtained for regression of any power of $\sum_{j=1}^N x_j$ on $\sum_{j=1}^N y_j$; regression of the mean for $\frac{1}{2} \sum_{j=1}^N x_j^2$ on $\frac{1}{2} \sum_{j=1}^N y_j^2$ in terms of Romanowsky polynomials; regression of the mean for $\frac{1}{2} \sum_{j=1}^N x_j^2$ on $\sum_{j=1}^N y_j$ in terms of Hermite polynomials; regression of the mean for $\sum_{j=1}^N y_j$ on $\frac{1}{2} \sum_{j=1}^N x_j^2$ in terms of Romanowsky polynomials; and regression of the mean for $\sum_{j=1}^N (x_j + y_j)$ on $\sum_{j=1}^N y_j$ and conversely in terms of Hermite polynomials.

The theorems and procedures considered in the paper were such that an extension to cover the case of a finite number of components instead of two, and extensions to cases where the components are unrelated as to type of distribution may be easily realized.

Microfilm \$2.50; Xerox \$3.00. 57 pages.

CUMULATIVE FUNCTIONS AND RELIABILITY

(L. C. Card No. Mic 60-351)

Joseph M. Moser, Ph.D.
St. Louis University, 1959

After some historical notes regarding the work done on cumulative functions and their properties are made, new cumulative functions are developed in this paper by using the Bernoulli differential equation, $dy/dx + Py = Qy^n$, where y is the cumulative frequency function $F(x)$.

Using the definitions of Burr, the n th cumulative moment for some of these newly developed cumulative frequency functions and for cumulative frequency functions developed by other authors is obtained by actually carrying out the integration or summation, as the case may be. It is seen that some cumulative frequency functions have no cumulative moments, others have some and in some cases restrictions have to be made on the parameter or parameters of the function so that the cumulative moments can exist.

It is shown that when the method of curve fitting by using moments fails (the method used by Burr), other methods can be used, such as inspection, interpolation, ratio M and others. Inspection is the method where the prediction function is graphed, the empirical function is graphed on the same graph and then points of intersection of the two are determined by sight. In interpolation, applicable with functions of one parameter, a lower and upper bound are found for the parameter and then by interpolation the value of the parameter is chosen which will yield the sum of the chosen prediction function's values very close to the corresponding sum of the empirical function's values. Ratio M is developed because the function $[x^{-k} + 1]^{-r}$ could not be handled in curve fitting by moments. Ratio M is the ratio of the abscissa of the mode to the abscissa of the median. Since the ratio M is always less than one for the function $[x^{-k} + 1]^{-r}$, the mirror image of the empirical data is used whenever the empirical ratio M is greater than one. By means of a chart of values of M the value of the parameters are chosen.

Since the Stieltjes integral has the property that both a continuous function and a discrete function can be integrated by Stieltjes integration, the Stieltjes integral is used to define cumulative moments. In the case where the cumulative frequency function is of two variables, Derwort's definitions are used but the Riemann integrals are replaced by Stieltjes integrals. The necessary changes that have to be made in Derwort's definitions whenever the cumulative frequency function is a discrete function are indicated.

A reliability function is defined to be $R(x) = 1 - F(x)$. The moments defined for $R(x)$ are very similar to those for cumulative functions and can be expressed in terms of cumulative moments of $F(x)$.

Microfilm \$2.50; Xerox \$4.60. 90 pages.

MODULI OF CONTINUITY OF QUASI-SMOOTH FUNCTIONS

(L. C. Card No. Mic 60-586)

Sidney Dean Nolte, Ph.D.

Iowa State University of Science and Technology, 1959

Supervisor: Henry P. Thielman

The class $L(a,b)M$ of functions f which are continuous on $[a,b]$ and which satisfy

$$(1) \quad \left| \frac{f(x+h) + f(x-h)}{2} - f(x) \right| \leq M|h|,$$

$$M > 0, x+h, x-h \in [a,b],$$

is called the class of quasi-smooth functions. In this thesis, the generalized mean is applied to the second difference to form the class $L_\psi(a,b)M$ of generalized quasi-smooth functions. The function f is an element of $L_\psi(a,b)M$ if and only if f is continuous on $[a,b]$ and

$$(2) \quad |M_\psi[f(x+h), f(x-h)] - f(x)| \leq Mh,$$

$$M, h > 0, x+h, x-h \in [a,b],$$

where M_ψ is the generalized mean generated by ψ .

It is proved that if M_ψ is the weighted arithmetic mean with weight constants $p, q \neq 1/2$, then

$$\omega(h) = \sup_{f \in L_\psi(a,b)M} \omega(f,h) = \frac{Mh}{|p-q|}.$$

Here $\omega(f,h)$ is the modulus of continuity of f , that is,

$$\omega(f,h) = \sup_{|x_1 - x_2| \leq h} |f(x_1) - f(x_2)|.$$

It is then proved that if M_ψ is any non-symmetric mean generated by ψ and if $\lim_{h \rightarrow 0} \frac{\omega(f,h)}{h} = C < \infty$, then $\omega(\psi f, h) \leq \frac{MCh}{|p-q|}$ and $\omega(f,h) \leq \omega^{-1}(\psi, \frac{MC}{|p-q|}h)$. Here ψf means $\psi[f(x)]$ and $\omega^{-1}(\psi, h)$ means the inverse of $\omega(\psi, h)$ considered as a function of h alone. The constants p and q are the weight constants for M_ψ .

A function f is said to be convex with respect to ψ if and only if

$$M_\psi[f(x+h), f(x-h)] - f(x) \geq 0, h > 0.$$

In this thesis it is proved that if M_ψ is the weighted arithmetic mean and if f is continuous and convex with respect to ψ , then f is monotone.

The class $L^*(-1,1)1$ of quasi-smooth functions on $[-1,1]$ which vanish at $+1$ and -1 is considered. It is proved that

$$K = \sup_{f \in L^*(-1,1)1} \left\{ \max_{-1 \leq x \leq 1} |f(x)| \right\} \leq \frac{79}{60}.$$

This bound on K is an improvement of the bound of $4/3$ obtained by Timan.¹

If M_ψ is applied to $L^*(-1,1)1$, where M_ψ is the arithmetic mean, then

$$L = \sup_{f \in L_\psi^*(-1,1)1} \left\{ \max_{-1 \leq x \leq 1} |f(x)| \right\} \leq \frac{4}{3} \left\{ \max[p,q] + \frac{1}{2} \right\},$$

where p and q are the weight constants for M_ψ .

Microfilm \$2.50; Xerox \$3.00. 35 pages.

1. Timan, A. F. On Quasi-Smooth Functions (in Russian, translated title). *Izvestiya Akad. Nauk SSSR. Ser. Mat.* 15: 243-254. 1951.

REGULAR MEASURES AND STOCHASTIC PROCESSES IN TOPOLOGICAL GROUPS

(L. C. Card No. Mic 59-6755)

Rajakularaman Ponnuswami Pakshirajan, Ph.D.
University of Oregon, 1960

Adviser: Herman Rubin

Abstract valued random variables are being studied by various authors. However, the present study is the first one to consider random variables taking values in an arbitrary locally compact Hausdorff topological group G . A chief tool in the investigation is a result due to Pontrjagin which states that if G is generated by a compact symmetric neighbourhood N of the identity e in G then there exists a discrete subgroup D such that G/D is compact and $D \cap \{N + N - N\} = \{e\}$. The main results proved are: To every regular measure μ in a locally compact Hausdorff space there corresponds a unique closed set every relatively open subset of which has positive μ -measure. A new proof is given of a result due to Bochner regarding the absolute continuity of a regular measure μ with respect to the Haar measure when G is compact and new criteria are given when G is a locally compact (not necessarily abelian) group and μ a locally σ -finite regular measure. The usual Kolmogorov's three series theorem on the real line is extended to G -valued random variables (G is assumed to be abelian). In Chapter III, a procedure is described for defining a probability measure in the product measurable space of locally compact Hausdorff spaces with prescribed marginals. The final two chapters study the sample function properties of stochastic processes in a locally compact σ -compact, abelian metric group. It is proved that if a differential process with a bounded interval T on the real line for its parameter space is stochastically continuous at each point of T then there is a realisation of the process almost all sample functions of which have both left and right limits everywhere in T . It is further proved that the number of jumps of such a process lying outside a compact symmetric neighbourhood of e has a Poisson distribution.

Microfilm \$2.50; Xerox \$3.00. 59 pages.

SOLUTION OF THE INITIAL VALUE PROBLEM FOR THE LINEARIZED MULTI-VELOCITY TRANSPORT EQUATION WITH A SLAB GEOMETRY

(L. C. Card No. Mic 60-514)

George Herbert Pimbley, Ph.D.
New York University, 1957

Adviser: Professor Peter Lax

The linearized Multi-Velocity Transport equation is a vector integro-differential equation arising in neutron transport theory. In the time dependent case with which we

deal, it describes the behavior of neutrons as they diffuse through a medium subject to processes of scattering, capture, and fission. We discuss the special case where the medium is in the shape of an infinite homogeneous slab of material of thickness $2a$. On the free surfaces of this slab, physical considerations impose certain boundary conditions. The initial value problem for the slab geometry gives the neutron behavior, subject to these boundary conditions, for all subsequent time, relative to the hypothesis that the neutrons have a given distribution at time $t = 0$.

First, the multi-velocity treatment is explained, and the method derived from a much more general velocity-dependent form of the transport equation. With the introduction of vector and matrix notation, the general n -velocity problem which results, is put into a very convenient compact form. Namely, after introduction of an appropriate Hilbert Space \hat{H} , the transport equation assumes the form

$$\frac{\partial \bar{N}}{\partial t} = A\bar{N}$$

where A is a linear operator on \hat{H} . Here, \bar{N} is the neutron distribution vector whose components are the neutron distributions for fixed velocity groups.

Next, an attempt is made at characterizing the spectrum of A . This operator turns out to be neither bounded nor self-adjoint. Nevertheless, methods are developed which give the spectral decomposition. It is found that the spectral plan can be divided into two parts by a vertical line. The region to the left of this line can be further subdivided into vertical strips. The leftmost strip is shown to belong to the continuous spectrum. The remaining strips consist entirely of points of the spectrum, but as one progresses from strip to strip, from left to right, it becomes increasingly harder to say whether these points belong to the continuous, residual, or point spectra. To the right of the vertical line, it is shown that any point is either in the point spectrum or the resolvent set. Next, attempts are made to characterize those points which are in the point spectrum, and lie to the right of the vertical line. While certain information is developed for the general case, it is found necessary to restrict the generality in order to show that these points form a discrete set. Under this restriction, it is also shown that these points constitute a finite set lying on the real axis.

While this information about an unusual operator might be of interest in itself, the purpose is to use this information in describing the solution of the problem. By using a variant of the Hille-Yoshida Theorem on the existence of semi-groups, the solution of the n -velocity initial value problem is shown to exist, to be unique in \hat{H} , and to depend continuously on the initial data. Strong topology is used, and the initial data must be restricted somewhat. Then by a known result, this solution is represented as a line integral in the strong sense, with integration along a path in the resolvent set. Next, under the restriction mentioned above, the path of integration is shifted so as to collect residues from the point spectrum, whose points are first order poles of the resolvent. This yields a finite expansion in terms of eigenelements of A , plus a residual term resulting from the rest of the spectrum. Under further restriction, this residual term is shown to become unimportant compared to the behavior of the finite expansion.

Microfilm \$2.50; Xerox \$6.20. 128 pages.

PSEUDOANALYTIC FUNCTIONS WITH CHARACTERISTIC COEFFICIENTS IN L_p

(L. C. Card No. Mic 60-515)

Ivan P. Polonsky, Ph.D.
New York University, 1957

Adviser: Lipman Bers

Let F and G be two complex valued functions of two real variables with strong L_p ($p > 2$) $L_{p'}(1 < p' < 2)$ derivatives as defined by Friedrichs and Sobolev and satisfying the condition $\text{Im}(\bar{F}G) > 0$. The characteristic coefficients a, b, A, B (cf. Bers, Bulletin, American Mathematical Society vol. 62(1956) no. 4 p. 293.) of the generating pair (F, G) are defined by the equations

$$\begin{aligned} F_{\bar{z}} &= aF + b\bar{F}, & G_{\bar{z}} &= aG + b\bar{G} \\ F_z &= AF + B\bar{F}, & G_z &= AG + B\bar{G}. \end{aligned}$$

If the characteristic coefficients are in L_p and $L_{p'}$ (condition C) the generating pair (F, G) is said to satisfy condition C.

Since $\text{Im}(\bar{F}G) > 0$ there exist two real valued functions ϕ, ψ defined by the equation $w = \phi F + \psi G$ for each function w . Bers has defined a function w to be (F, G) pseudoanalytic of the first kind in a domain D if

$$\lim_{z \rightarrow z_0} \frac{W(z) - \phi(z_0)F(z) - \psi(z_0)G(z)}{z - z_0}$$

exists and is finite at every point z_0 in D .

Let (F, G) satisfy condition C. It is then proved that in a bounded domain a function w is (F, G) pseudoanalytic if and only if its strong derivatives satisfying the equation $w_{\bar{z}} = aw + b\bar{w}$. Also if a, b satisfy condition C (i) there exists a generating pair (F, G) with a, b as the first two characteristic coefficients. (ii) (F, G) has a successor with characteristic coefficients satisfying condition C. (iii) A bounded continuous function w is (F, G) pseudoanalytic if and only if

$$(*) \quad f(z) = w(z) + 1/\pi \iint \frac{a(\zeta)w(\zeta) + b(\zeta)\bar{w}(\zeta)}{\zeta - z} d\xi d\eta$$

is analytic. The similarity principle of Bers is also proved under this weaker hypothesis and is then used to prove Taylor and Laurent expansion theorems for pseudoanalytic functions.

By assuming $a(z) |z|^{2(p-2)/p}$, $b(z) |z|^{2(p-2)/p}$ are also in L_p a theorem of I. N. Vekua about the existence of a solution of equation (*) is extended to arbitrary domains.

Microfilm \$2.50; Xerox \$5.00. 96 pages.

EMBEDDING TOPOLOGICAL SPACES IN TOPOLOGICAL SEMIGROUPS WITH THE SAME SEPARATION PROPERTIES

(L. C. Card No. Mic 60-352)

Sister Mary Rose Rauen, O.S.B., Ph.D.
St. Louis University, 1959

A topological semigroup is a topological space (S, \mathcal{W}) having an associative, binary relation (\cdot) defined on S and continuous relative to \mathcal{W} .

Let a topological space (X, \mathcal{F}) be given and let P be the free algebraic semigroup (P, \cdot) generated by X . Denote by S the semigroup obtained by deleting the identity from P . Suppose that I is a set of functions γ such that γ assigns to each x in X one of its open neighborhoods $N_\gamma(x)$. A topology \mathcal{W} is defined on S in terms of products of these open neighborhoods of the points in X . Specifically, if $s = x_1 x_2 \dots x_n$ is a word in S , the fundamental system of neighborhoods of s is given by

$$\mathcal{W}(s) = \left\{ \prod_{i=1}^n N_\gamma(x_i) \right\}_{\gamma \in I}.$$

Then (X, \mathcal{F}) is embedded in (S, \mathcal{W}) and the operation in S is continuous relative to \mathcal{W} , that is, (S, \mathcal{W}, \cdot) is a topological semigroup containing (X, \mathcal{F}) . Furthermore, any of the separation properties-- T_0 , T_1 , T_2 , regular, regular and T_1 , completely regular, completely regular and T_1 --possessed by (X, \mathcal{F}) are also enjoyed by the embedding space (S, \mathcal{W}) .

Another topology \mathcal{V} on S , making the operation in S continuous and the subspace $(X, \mathcal{V} \cap X)$ homeomorphic to (X, \mathcal{F}) is described. This topology has as the system of fundamental neighborhoods of a word $s = x_1 x_2 \dots x_n$ in S the family

$$\mathcal{V}(s) = \left\{ \prod_{i=1}^n U_\gamma(x_i) \right\}_{\gamma \in I},$$

where

$$U_\gamma(x_i) = \{y_1 y_2 \dots y_t \mid y_j \in N_\gamma(x_i); j = 1, 2, \dots, t; t \geq 1\}.$$

Although for a given T_0 -space (X, \mathcal{F}) the topological semigroup (S, \mathcal{V}, \cdot) is T_0 , the analogous statement does not hold for a T_1 -space.

Finally, a topology \mathcal{U} , similar to \mathcal{V} , is imposed on S together with the algebraic restriction $xx = x$. The resulting topological semigroup possesses any of the separation properties listed above for (S, \mathcal{U}, \cdot) , if (X, \mathcal{F}) has the corresponding property, with the exception of that of T_0 .

Microfilm \$2.50; Xerox \$4.00. 73 pages.

SOME PROPERTIES OF THE FUNDAMENTAL SOLUTION OF THE PARABOLIC EQUATION

(L. C. Card No. Mic 60-269)

Stewart M. Robinson, Ph.D.
Duke University, 1959

Supervisor: Francis G. Dressel

Consider the parabolic equation

$$L(u) = \sum_{i,j=1}^n a_{ij} \partial^2 u / \partial x_i \partial x_j + \sum_{i=1}^n a_i \partial u / \partial x_i + au - \partial u / \partial t = 0,$$

where the coefficients a_{ij} , a_i and a are bounded and continuous functions of the variables x_1, \dots, x_n, t and satisfy Hölder conditions with respect to the space variables, x_1, \dots, x_n . Assume further that there exist two positive constants, g and G , such that

$$g \sum_{i=1}^n X_i^2 \leq \sum_{i,j=1}^n a_{ij} X_i X_j \leq G \sum_{i=1}^n X_i^2.$$

Let Ω be any measurable subspace of Euclidean n -space, E_n , and let T be a positive constant. If the above conditions hold in $\Omega \times [0, T]$, we show that there exists in this

region a fundamental solution, Γ , of the differential equation $L(u) = 0$.

Making use of several theorems in the existence proof of the fundamental solution, Γ , we derive some properties enjoyed by this function. In particular, Γ is proved to satisfy the Chapman-Kolmogorov relation

$$\int \int \int_{E_n} \Gamma(A, t; M, \eta) \Gamma(M, \eta; B, \tau) dM = \Gamma(A, t; B, \tau),$$

and under the additional hypothesis that the functions $\partial^2 a_{ij} / \partial x_i \partial x_j$, $\partial a_i / \partial x_i$ exist and are continuous and bounded and satisfy Hölder conditions with respect to the space variables, $\Gamma(A, t; B, \tau)$ is shown to be a solution of the equation adjoint to $L(u) = 0$ in the pair (B, τ) .

Microfilm \$2.50; Xerox \$3.00. 44 pages.

ON LARGE DEFLECTIONS OF BEAMS

(L. C. Card No. Mic 60-696)

Florence Virginia Rohde, Ph.D.
University of Kentucky, 1950

Expressions are obtained for the elastic deflection of beams when the curvature of the beam is sufficiently large that it may no longer be approximated simply by d^2y/dx^2 . It is assumed that the inclination of the deflection curve at the end points does not exceed 60° , that the bending does not alter the length of the beam, and that the cross section of the beam is the same throughout its length.

Simpler solutions of the deflection equation than heretofore have been obtained for the circumstance that the load is concentrated in the middle, an improved solution is given for a cantilevered beam with load at one end, and a new solution is given for the case that the beam is supported at both ends but loaded off center. Finally, a series solution is found for a cantilever with uniformly distributed load. Microfilm \$2.50; Xerox \$3.60. 63 pages.

ON ESTIMATING PARTIAL DIFFERENTIAL OPERATORS IN THE L_2 NORM

(L. C. Card No. Mic 60-517)

Martin Schechter, Ph.D.
New York University, 1957

Adviser: Professor L. Nirenberg

Given any finite set (A_k) of linear m -th order partial differential operators acting on a class of functions u , we are concerned with L_2 estimates of the m -th order derivatives of the u in terms of the $A_k u$. More precisely, we consider the inequality

$$(1) \quad \|D^m u\|^2 \leq K(\sum \|A_k u\|^2 + \|u\|^2),$$

where $D^m u$ denotes the generic m -th order derivative of u . It is assumed that the complex coefficients of the A_k are continuous in a bounded domain G . The norm is that of $L_2(G)$.

We first consider (1) with reference to classes $C^{mr}(G)$,

$0 \leq r \leq m$, of complex functions, each m times continuously differentiable in the closure \bar{G} of G and having all derivatives of order less than r vanishing on the boundary E of G . Our investigations lead to the consideration on E of complex vector roots common to the characteristic polynomials P_k of the A_k . At each point x of E consider those common vector roots with imaginary parts perpendicular to the boundary. We then define the integer $q(x)$, which is essentially the greatest number of such roots with imaginary parts pointing in any one direction (inward or outward). For E in class C^m our main theorem states that there exists a constant K depending only on G and the A_k such that (1) holds for all $u \in C^{mr}(G)$ if and only if the P_k do not have any real vector roots in common in \bar{G} and $q(x) \leq r$ for each point x of E . An immediate consequence of this in dimensions higher than the second is that for one operator A_1 , $\|D^m u\|^2 \leq K(\|A_1 u\|^2 + \|u\|^2)$ holds for all $u \in C^{mr}(G)$ if and only if A_1 is elliptic in \bar{G} and $m \leq 2r$.

We can generalize our main theorem as follows. To each point x of E assign a non-negative integer $j(x) \leq m$ and a neighborhood $N(x)$. Let $C^{mj}(G)$ be the set of all complex functions u which are m times continuously differentiable in \bar{G} and such that for each point x of E all derivatives of order less than $j(x)$ vanish on $E \cap N(x)$. Then there is a constant K depending only on G , $j(x)$, $N(x)$, and the A_k such that (1) holds for all $u \in C^{mj}(G)$ if and only if the P_k have no common real vector roots in \bar{G} and $q(x) \leq j(x)$ at each point x of E .

Our proofs follow a method due to Garding and Aronszajn. It consists of reducing the problem to a similar one for homogeneous operators with constant coefficients in a special type of domain. This special case is then solved by Fourier transform methods.

Microfilm \$2.50; Xerox \$3.00. 55 pages.

SOME RESULTS IN COMBINATORIAL SET THEORY

(L. C. Card No. Mic 60-519)

Lena Sharney, Ph.D.
New York University, 1957

Adviser: Professor H. Shapiro

This thesis deals primarily with generalizations of a theorem of Sperner (Emanuel Sperner; Ein Satz über Untermengen einer endlichen Menge; Mathematische Zeitschrift, Band. 27, 1928) which may be stated as follows:

Let $\mathcal{M}^{(n)}$ be a set of n distinct objects a_1, a_2, \dots, a_n , and let a collection of subsets of $\mathcal{M}^{(n)}$ be "admissible" if none of the subsets contains another. Then the number of subsets in an "admissible collection" does not exceed the middle coefficient of the binomial expansion to the power n ,

and is actually equal to $\binom{n}{\lfloor \frac{n}{2} \rfloor}$ in the following cases:

1. When n is even and the collection consists of all subsets of $\mathcal{M}^{(n)}$ which contain $\frac{n}{2}$ objects each.
2. When n is odd and the collection consists either of all subsets containing $\frac{n+1}{2}$ objects, or all subsets containing $\frac{n-1}{2}$ objects.

This theorem plays an important role in the approximations of certain distribution functions and it seems probable that more general formulations involving sums of mutually exclusive "admissible collections" may find further application in number theory.

Theorem I of this thesis is a direct extension of Sperner's theorem to sums of mutually exclusive "admissible collections" of the subsets of $\mathcal{M}_r^{(n)}$, or one-dimensional $\sqrt{\text{sets}}$ (see Section 2 of the thesis). It states that the number of elements in a k -dimensional $\sqrt{\text{set}}$ does not exceed the sum of k middle coefficients of the binomial expansion to the power n , and that the equality sign holds only for the $\sqrt{\text{sets}}$ whose elements consist of the symmetric functions of a_1, a_2, \dots, a_n , corresponding to the respective coefficients of the expansion. When $k = 1$, theorem I reduces to the above Sperner's theorem.

However, the concepts inherent in Sperner's theorem are capable of much wider expansions than a direct extension to sums of "admissible collections." Two further generalizations are embodied in theorems II and III of this thesis.

Theorem II deals with $\sqrt{\text{sets}}$ whose elements contain objects of $\mathcal{M}_r^{(n)}$ with a multiplicity of at most r , $r \geq 1$ (see Section 2 of the thesis). The number of elements in such k -dimensional $\sqrt{\text{sets}}$ does not exceed the sum of middle coefficients of the expansion of $(1 + \alpha + \alpha^2 + \dots + \alpha^r)^n$.

When $nr + k$ is odd the equality relation has one solution.

When $nr + k$ is even the equality relation has two solutions.

Theorem III deals with $\sqrt{\text{sets}}$ whose elements contain only one or none of possible alternatives of each r -tuple of $\mathcal{M}_r^{(n)}$ (see Section 6 of the thesis). The number of elements in such k -dimensional $\sqrt{\text{sets}}$ does not exceed the sum of k maximal coefficients $\binom{n}{i_j} r^{i_j}$, $j = 1, \dots, k$, of the expansion of $(1 + r\alpha)^n$. The equality relation has one solution for each k and n except when $k = 1$, in which case two solutions exist for all n such that $n \equiv r \pmod{r+1}$.

Theorems II and III reduce to the case of a single occurrence (Theorem I), and hence to Sperner's theorem, for the special case of one-dimensional $\sqrt{\text{sets}}$. Thus this thesis presents two additional general methods of proving Sperner's theorem.

Microfilm \$2.50; Xerox \$3.00. 51 pages.

A GENERALIZED MATRIX METHOD OF SUMMABILITY

(L. C. Card No. Mic 60-709)

William Clement Swift, Ph.D.
University of Kentucky, 1955

Supervisor: Dr. V. F. Cowling

1. Given a matrix of complex numbers, $A = (a_{nk})$, a sequence $\{x_k\}$ is said to be summable- A to x if

$$x = \lim_{n \rightarrow \infty} \sum_{k=0}^{\infty} a_{nk} x_k.$$

A matrix A is said to be regular if every convergent sequence is summable- A to its natural limit.

In this paper, a more general method of summability

related to a regular matrix is defined in which, for instance, the requirement of convergence of the series $\sum_{k=0}^{\infty} a_{nk} x_k$ may be replaced by the summability-A of the sequences of partial sums $\left\{ \sum_{k=0}^j a_{nk} x_k \right\}_{j=0}^{\infty}$; and similarly the sequence of generalized limits may be subjected to the summability method.

A generalization of a well-known theorem of Y. Okada is found; and a simple but effective application is displayed.

2. A multiple infinite sequence of dimension n is defined to be a mapping of the ordered n -tuples of non-negative integers into complex numbers. Let $X = \{x_{k_1 k_2 \dots k_n}\}$ represent a multiple infinite sequence; and $x_{k_1 k_2 \dots k_n}$ be the particular element corresponding to the values of the indices, k_1, k_2, \dots, k_n .

If $\lim_{k_n \rightarrow \infty} x_{k_1 k_2 \dots k_{n-1} k_n}$ exists for each combination of the first $n-1$ indices, then the limiting operator L applied to X yields the $n-1$ dimensional multiple infinite sequence obtained as follows:

$$L \cdot X = L \cdot \{x_{k_1 k_2 \dots k_n}\} = Y = \{y_{k_1 k_2 \dots k_{n-1}}\},$$

where the elements of Y are respectively,

$$y_{k_1 k_2 \dots k_{n-1}} = \lim_{k_n \rightarrow \infty} x_{k_1 k_2 \dots k_{n-1} k_n}.$$

Corresponding to a matrix $A = (a_{nk})$ the matrix operator A applied to X is defined to be the $n+1$ dimensional multiple infinite sequence obtained thus:

$$A \cdot X = A \cdot \{x_{k_1 k_2 \dots k_n}\} = Y = \{y_{k_1 k_2 \dots k_{n+1}}\},$$

where

$$y_{k_1 k_2 \dots k_{n+1}} = \sum_{j=0}^{k_{n+1}} a_{knj} x_{k_1 k_2 \dots k_n j}.$$

The product of successive applications of the limiting operator L and matrix operators A_i (not necessarily related to the same matrix) is called an iterated matrix operator. If the matrix operators are all associated with the same matrix A , then the product is called an iterated A -operator.

Analogous to uniform convergence, the concept of uniformity in the application of an iterated matrix operator is defined.

THEOREM. If W_1 and W_2 are iterated A -operators corresponding to a regular matrix A , and $\{x_k\}$ is a sequence such that $W_1 \cdot \{x_k\}$ and $W_2 \cdot \{x_k\}$ are both defined and both zero-dimensional (i.e., simply numbers), then

$$W_1 \cdot \{x_k\} = W_2 \cdot \{x_k\}$$

If x is the value of these expressions, then the sequence $\{x_k\}$ is said to be ultimately summable- A to x . Natural convergence and conventional summability are seen to be special cases of ultimate summability.

3. The concepts of the partial and the principal star domains, employed in the following discussion, are well known.

THEOREM. Let $f(z) = \sum_{i=0}^{\infty} c_i z^i$ have non-zero radius of convergence; and let $s_k(z) = \sum_{i=0}^k c_i z^i$.

Suppose that W is an iterated matrix operator such that

$$1. W \cdot \{(1)_k\} = 1,$$

and $2. W \cdot \{z^k\} = 0$, uniformly for z in each compact set in a domain Q .

Then, $W \cdot \{s_k(z)\} = f(z)$, the value of the principal branch of the function, uniformly for z in each compact set in the partial star domain of $f(z)$ with respect to Q .

In the case $W = LLA$, this theorem reduces essentially to the well known theorem of Okada.

An interesting application of the preceding theorem is found in the ultimate effectiveness of the S_α methods. The matrix elements of an S_α method are of the form:

$$a_{nk} = \binom{n+k-1}{k} \cdot (1 - \alpha)^n \alpha^k.$$

THEOREM. Let $f(z) = \sum_{i=0}^{\infty} c_i z^i$ be regular in a neighborhood of the origin; and let $s_k(z) = \sum_{i=0}^k c_i z^i$. Then, if $\frac{1}{2} \leq \alpha < 1$, the sequence of partial sums, $\{s_k(z)\}$ is ultimately summable- S_α to the value of the principal branch of the function throughout its principal star domain.

Microfilm \$2.50; Xerox \$3.80. 68 pages.

AN EXTENSION OF THE THEORY OF CUMULATIVE FREQUENCY FUNCTIONS TO N VARIABLES

(L. C. Card No. Mic 60-355)

Sister Mary Alberta Uzendoski, O.S.F., Ph.D.
St. Louis University, 1959

The univariate cumulative frequency moment theory developed by I. W. Burr and C. W. Topp and the bivariate, by B. J. Derwort, was further investigated for cumulative distribution functions of n variables.

It was the purpose of this dissertation to generalize the existing theory of moments, characteristic functions, and moment-generating functions to multivariate cumulative distributions. Statistical independence and dependence served as a basis for further subdivision of the extension.

For the independent case the moment theory consisted of a definition of a cumulative moment about the origin, as well as about $x_i = a_i$, a more general point than heretofore given. In addition, analogues of eight relations between standard and cumulative moments, and between cumulative moments about the origin and about $x_i = a_i$ were stated. These results were easily verified because of multiplicative property arising from statistical independence.

Unlike the earlier definition of a cumulative moment for the dependent case, the moment was defined in terms of marginal distributions. Thus the definitions of special functions to be used in the formulation of the moment definition were eliminated. The moments as defined exist under high contact assumptions on the integrands and their derivatives. A further restriction, continuity at every point, on all partial derivatives of the cumulative marginal distributions and of the original function was made. Although the definitions of the moments for the two cases differ, they are composed of the same number of terms; and, if statistical independence is assumed in the dependent case, it reduces to the cumulative moment as defined for

a function of n independent variables. Moreover, the relation between cumulative moments was found to be in accord with that for the independent case.

Similarly, an extension was made of the theory of cumulative characteristic and moment-generating functions found in previous theoretical work. This theory included definitions for one and two independent variables; establishment of the existence and moment-generating property of Φ , the cumulative characteristic function; a relation between ϕ , the characteristic frequency function, and Φ ; and the properties of cumulative moment-generating functions. Moreover, an attempt was made to formulate a cumulative characteristic function for n dependent variables. This function exists under high contact assumptions previously found necessary for the existence of the cumulative moments for n dependent variables. Due to the complicated nature of the equation defining the function, the relation between Φ and ϕ was verified for $n \leq 3$ only.

Microfilm \$2.50; Xerox \$4.40. 84 pages.

A VARIABLE PROBABILITY DISTRIBUTION FUNCTION

(L. C. Card No. Mic 60-718)

Ruric E Wheeler, Ph.D.
University of Kentucky, 1952

It was our purpose in this work to consider two problems: (1) the determination of the probability of x successes in n trials, denoted by $P(n,x)$, where the probability of success on a single trial varies with the number of the trial and the number of previous successes, (2) a study of the distribution determined by $P(n,x)$.

Definition I. Let Q_i be a probability function such that

- (a) $Q_i = q_{i+1,i}$ where $p_{i,j}$ and $q_{i,j}$ represent respectively the probability of success and failure on the i th trial after j successes with $p_{i,j} + q_{i,j}$ always being unity,
- (b) $Q_i^0 = 1$,
- (c) $Q_i Q_j Q_k = Q_j Q_i Q_k = Q_j Q_k Q_i = q_{i+1,i} q_{j+2,j} q_{k+3,k}$ for $i \leq j \leq k$,
- (d) $Q_i [Q_j + Q_k] = Q_i Q_j + Q_i Q_k$.

Definition II. Let S_i be a function associated with x successes such that

- (a) $S_i = \prod_{t=0}^{i-1} p_{t+1,t} \cdot \prod_{t=i}^{x-1} p_{t+2,t} Q_i$ where $i \leq x$ and $\prod_{t=a}^b p_{t+1,t} = 1$ for $b < a$,
- (b) $S_i^0 = \prod_{t=0}^{x-1} p_{t+1,t}$,
- (c) $S_i S_j S_k = S_j S_i S_k = S_j S_k S_i$
 $= \prod_{t=0}^{i-1} p_{t+1,t} \cdot \prod_{t=i}^{j-1} p_{t+2,t} \cdot \prod_{t=j}^{k-1} p_{t+3,t} \cdot \prod_{t=k}^{x-1} p_{t+4,t}$
 $Q_i Q_j Q_k$ for $i \leq j \leq k \leq x$ where if S is associated with x_i successes, S_i with x_j successes, and S_k with x_k successes, the $S_i S_j S_k$ is associated with the maximum of x_i , x_j and x_k successes,
- (d) $S_i [S_j + S_k] = S_i S_j + S_i S_k$.

By using several properties of the function, S_i^x , given as lemmas in Chapter I, we were able to obtain

Theorem I. If the probability of success on a single trial depends on the number of the trial and on the number of previous successes, then the probability of x successes in n trials is given by $P(n,x) = \Delta^x S_0^n$.

This general result enabled us to discuss the following theorems

Theorem II. If the probability of success on a single trial is a rational number such that the numerator and denominator respectively are decreased by a constant h for each success and each trial, then

$$P(n,x) = \frac{C_x^n (Np)^{(x)} (Nq)^{(n-x)}}{N(n)}$$

where $p_{1,0}$ is given by Np/N and the factorials are at intervals of h .

Theorem V. If the probability of success on a single trial decreases by a constant k after each success then the probability of x successes in n trials is given by

$$\frac{P_{1,0} (p_{1,0} - k) \cdots (p_{1,0} - (x-1)k)}{k^x} \cdot \left| \sum_{t=0}^x \frac{(-1)^t (q + tk)^n}{\underline{x-t} \underline{x}} \right|.$$

The remainder of this paper was devoted to the proof of theorems which give the important properties of our generalized distribution function.

Theorem VI. The k th moment about the origin of the generalized distribution function, $P(n,x) = \Delta^x S_0^n$, is

$$\mu'_{k,x} = \sum_{t=1}^k \int_k^{(t)} \sum_t \Big|_{\theta=0} \text{ for } k < n.$$

Theorem VII. The k th moment about the origin of the generalized distribution function, $P(n,x) = \Delta^x S_0^n$, is $\mu'_{k,x} = \int_k^{(n)} \underline{n} p_{1,0} p_{2,1} \cdots p_{n,n-1} \sum_{t=1}^{n-1} \int_k^{(t)} \sum_t \Big|_{\theta=0} \text{ for } k \geq n$.

Theorem VIII. The moments about the origin of the generalized distribution function, $P(n,x) = \Delta^x S_0^n$, satisfy the following recursion formulae:

- (a) $\mu'_{t,x} = \sum_{k|_{\theta=0}} - \sum_{t=1}^{k-1} S_k^{(t)} \mu'_{t,x} \text{ for } k < n$
- (b) $\mu'_{k,x} = \underline{n} n^{(k-n)} p_{1,0} \cdots p_{n,n-1} - \sum_{t=k-n+1}^{k-1} S_n^{(n-k+t)} \mu'_{t,x} \text{ for } k \geq n$.

Theorem IX. If the p 's and q 's of our moment-generating function are considered as independent, then the cumulants of our generalized distribution function satisfy the recursion formula:

$$\lambda_{r+1} = \sum_{k=1}^n \left\{ [q_{k,0}] \sum_{s=0}^{k-1} p_{k,s} \frac{\partial \lambda_r}{\partial p_{k,s}} - [p_{k,0}] \sum_{s=0}^{k-1} q_{k,s} \frac{\partial \lambda_r}{\partial q_{k,s}} \right\}.$$

From Theorem IX, we were able to obtain:

Corollary I. For the Poisson distribution the cumulants satisfy

$$\lambda_{r+1} = \sum_{k=1}^n q_k p_k \frac{\partial \lambda_r}{\partial p_k}.$$

Corollary II. A recursion formula for the cumulants of the Bernoulli distribution is given by $\lambda_{r+1} = n p q \frac{\partial \lambda_r}{\partial p}$.

Microfilm \$2.50; Xerox \$3.00. 40 pages.

A STUDY OF A BASIC SET
OF POLYHARMONIC POLYNOMIALS

(L. C. Card No. Mic 60-132)

Marion Cammack Wicht, Ph.D.
Alabama Polytechnic Institute, 1957

Supervisor: E. P. Miles, Jr.

Recent results concerning basic sets of harmonic, bi-harmonic and polyharmonic polynomials which are homo-

geneous independent solutions of certain partial differential equations are reviewed. Some of the Miles-Williams basic sets in two and three variables are computed and displayed. The relations between the Miles-Williams and Zweiling biharmonics are developed. Ordinary and differential recursion formulas are developed for the Miles-Williams biharmonics in two and in three variables.

Microfilm \$2.50; Xerox \$3.00. 40 pages.

MUSIC

TWO-VOICED TEXTURES
IN THE MIKROKOSMOS OF BELA BARTOK

(L. C. Card No. Mic 60-609)

William Dale Dustin, Ph.D.
Cornell University, 1959

The Mikrokosmos are 227 items of the mature musical thought of Bela Bartok. They exhibit the use of a wide variety of original musical materials. In the separate musical occasions, restrained varieties of means are directed with great economy to the formal-expressive ends, and to a comprehensive impression of straightforwardness and clarity of musical purpose. The formal and expressive syntax is closely related to familiar patterns. The impressions of clarity and directness may be traced in Bartok's techniques in rhythm, tonality, melody, etc. The concentration in this essay is on Texture.

In a customary view, Texture is a too rigid scheme, homophonic and contrapuntal or polyphonic, of which nearly every musical instance is a compromising qualification. As viewed here, Texture is a scale of degrees of sonority-conveyance and contrapuntal activity deriving from density (number and tessitura of voices), the natures of the separate voices in rhythmic- and pitch-actions, and their relative identities and functions in a composite impression. Textures with parts tending to sameness of motion convey sonority and sonority-succession; those with parts tending toward difference in motion convey contrapuntal activity. That view of Texture, flexible enough to include all occasions and emphasizing density and continuity activity deriving from number, identities and functions of lines, is the organizational basis for this study.

A survey reveals an extraordinary constancy in textural density in the Mikrokosmos. Whole pieces and segments of pieces are of constant voice-number and tessitura, and changes of textural density relate directly to formal demarcations. Few pieces or segments of pieces are "free-voiced."

The main body of the study concerns a closer examination of 152 two-voiced pieces and segments of pieces.

These are considered in succession according to their textural identities: homophonically extreme (parallel voices), of voices unequal in the texture (with secondary lines of pedal-point, ostinato, conveying harmony, and stronger counterline), and equal-voiced (grouped according to the degree in which imitation and related devices of interrelation of line control the actions of the voices).

In each group separate voices are examined in terms of rhythmic- and pitch-actions, and the composites are considered in rhythmic and tonal content and the manner in which these are conveyed. Special qualities of the separate groups are discussed. In addition, some rhythmic, tonal and smaller details of technique are identified in adaptations to the various constructions. These represent a core of consistency of technique across the scale of textural intensities.

Rhythmically, the Mikrokosmos are remarkably simple, considering they are a large number of musical expressions of a definite twentieth-century cast. Tonal usages range from paraphrases of common-practice content (conveyed in familiar textural situations), through a wide variety of separate scalar contents in the two voices, from mild combinations of different segments of a same mode or segments of different modes closely related by scalar emphases, to the tonal diffusion of combinations of scale segments of more remote relationship. Textural considerations such as exclusive scalar content in separate voices, limitations in range and degree of separation in tessitura are important in the tonal impressions of these polyscalar practices.

In different contexts, several authors have referred to the element of the classical in the music of Bartok. Across the broad expressive range of the Mikrokosmos, one finds Bartok assembling definable line types, of precise function, into clear textural identities. As a part of the technical command that allows wide flexibility of expression within closely limited means, these controlled textural impressions, of bold change or subtle nuance, contribute directly to the larger impression of classical economy and directness of musical purpose.

Microfilm \$4.30; Xerox \$15.10. 335 pages.

SINGING INTENSITY AS RELATED TO SINGER EXPERIENCE

(L. C. Card No. Mic 59-6120)

Ellwood Ross Ekstrom, Mus.D.
Indiana University, 1959

Chairman: Frank St. Leger

The thesis is a report of an exploratory study of singing intensity. An attempt was made to discover possible relationships between the amount of singer experience and: (1) the ability to control singing intensity in different types of acoustical environments, (2) general characteristics of singing intensity, and (3) responsiveness to acoustical environments in controlling singing intensity.

Four heterogeneous "experience groups" totaling thirty singers were used. These included: (1) professional singers, mostly with operatic experience, (2) graduate voice majors, (3) beginning collegiate voice students, and (4) untrained high school students.

Individual singers were taken to the first of three test rooms and requested to sing a simple musical pattern repeatedly at a loud and a soft level of intensity, which they believed suitable to the room. The intensity of tone was measured with a sound-level meter in decibels of sound pressure level (referred to 0.0002 dyne/cm²). The singers were then taken to two additional rooms, each with acoustical properties different than those of the first room, and were requested to sing the pattern at the identical levels of intensity they had established in the first room.

In examining the relationship of experience to singing intensity control, it was found that the heterogeneous groups of singers duplicated, with considerable accuracy, remembered levels of singing intensity in different types of acoustical environments. The individual singers varied widely in their abilities to duplicate levels of singing intensity. The accuracy of singing intensity control for loud singing was somewhat greater among the professional singers and the graduate voice students than among the less experienced singers. This was also true for soft singing, but to a lesser extent.

In examining the relationship of experience to singing intensity characteristics, it was found that the average levels of singing intensity were greater for each successively higher experience group. Differences between the intensity levels of loud and soft singing were greater for each successively higher group. The increase of singing intensity in relation to ascending pitch was proportionately the same for all singers. All groups of singers produced less increase in vocal intensity in the upper than in the middle part of the voice. This was especially true of the tenor voices.

In examining the relationship of experience to responsiveness to the acoustical environment, it was found that most of the professional singers and graduate students reported that the acoustical properties of the test rooms had little effect upon the control of singing intensity. A majority of the beginning students and untrained singers reported to the contrary. The professional and graduate singers advocated a greater reliance upon physical sensation than upon auditory sensation for accurate control of singing intensity. Fifty percent of all the singers preferred to sing in acoustically "live" rooms, with the majority of the less experienced singers expressing this preference.

Although, in some aspects of singing intensity control, the more experienced singers exhibited greater accuracy than the inexperienced singers, it was not generally indicated that a marked superiority of control resulted from greater vocal training and experience. However, important differences in levels of vocal intensity and in reliance upon the acoustical environment for the control of singing intensity were found to be related to singer experience.

Microfilm \$2.50; Xerox \$6.00. 125 pages.

THE CHURCH MUSIC OF THE OLD ORDER AMISH OF THE UNITED STATES

(L. C. Card No. Mic 60-436)

Rupert Karl Hohmann, Ph.D.
Northwestern University, 1959

Chairman: J. F. Ohl

The purpose of this study was to investigate the style of hymn singing of the Old Order Amish Church of the United States and, in so far as possible, to analyze and account for the origin of this florid style of singing which dates back to the early sixteenth century.

Included in the study is the following:

1. A brief historical survey of the religious background of the Old Order Amish group.
2. A description of the use of music in the Old Order Amish Church today.
3. A comprehensive description and illustration of the general aspects of Amish tunes.
4. Stylistic analysis of the tunes.
5. Three appendices illustrating Amish hymn tunes from divergent geographical locations, together with the source upon which each hymn tune is based; also included is a written commentary concerning the findings of each tune presented.

Findings of the Study

It is shown by examples that the origin of Amish hymn tunes is dependent upon secular and sacred folk song tunes, primarily of the fifteenth, sixteenth, and seventeenth centuries. Also, to a lesser degree, chorale melodies and pre-Reformation liturgical melodies of the Catholic Church served as root materials for Amish tunes. The tunes are not those of a sophisticated people, but rather of an untutored, simple folk; as such, the tunes retained the characteristics of the folk song for many years. The development of the Amish tunes from simple, syllabic melodies into the complex, highly ornamented tunes of the present is explained by the refusal of the Amish to notate their music. Their type of music is an example of a group attempt to perpetuate by memory only specific tunes over a period of hundreds of years. In due time the tune becomes increasingly slower and more ornamented until the original tunes are presently completely obscured and forgotten. The resulting style--much ornamentation interspersed among the root melody notes--has evolved into a manner of singing that is accepted by the Amish as always having been that way. The theory of tone addition over a period of years to a simple root melody is substantiated by

examples of hymn tunes adopted by the Amish, within the last seventy-five years.

The type of vocal ornamentation practiced by the Amish is that of a spontaneous nature, primarily on the part of the *Vorsaenger* who, in order to beautify the musical line, enlivens it through a technique of free improvisation.

Significant variations do exist in different versions of the same hymn tune, as is shown by examples; so much so, in fact, that it would be difficult for two different groups of the Amish from divergent geographic locations to sing the same tune together. However, it is also shown by examples that though the Amish have little social interchange among the various communities, it is amazing that the various versions of the same tune bear as much general resemblance to each other as they do.

Basic works used in locating the root melody of the Amish tunes are the following:

1. Zahn, Johannes, *Die Melodien der deutschen evangelischen Kirchenlieder*.
2. Boehme, Franz M., *Altdeutsches Liederbuch*.
3. Erk, Ludwig, and Boehme, Franz M., *Deutscher Liederhort*.

The Amish tunes presented are from three different sources:

1. *Amische Lieder*, by Jacob W. Yoder. This is the only printed book of Pennsylvania Amish tunes in existence today, which the Amish themselves do not use as they cannot read notes.
2. Recordings by John Umble, of Old Order Amish in Kalona, Iowa.
3. Recordings made by the writer of Old Order Amish at Partridge, Kansas.

Microfilm \$3.40; Xerox \$11.95. 262 pages.

A STUDY OF THE RELATIONSHIP BETWEEN VOWEL MODIFICATION AND CHANGES IN PITCH IN THE MALE SINGING VOICE:

A SPECTROGRAPHIC ANALYSIS, REINFORCED BY THE JUDGMENT OF PHONETICS EXPERTS.

(L. C. Card No. Mic 59-5446)

Robert W. Hohn, Mus. Ed. D.
Indiana University, 1959

Voice students are often taught to make some kind of vowel modification at certain points in the vocal range. This modification has as its purpose easier vocal production and smoother transitions from one part of the vocal range to another. The investigator believed that the results of acoustical analysis of the singing vowels of recognized male singers by sound spectrograph would provide valuable information concerning the practice of vowel modification.

Basic questions. The basic questions of the study were as follows: (1). What are the formants of each of the vowels of each of the singing voices at the different pitch levels? (2). What vowel modification, if any, (as evidenced by formant changes) occurs in each of the four vowels with the change in pitch level? (3). What patterning of vowel modification, if any, (as evidenced by formant patterning) occurs in the four vowels on the basis of the two types of voices, tenor and baritone? (4). What patterning of vowel

modification, if any, (as evidenced by formant patterning) of four vowels is associated with changes in pitch levels?

Procedures. Six baritones and six tenors were chosen for the study, their selection made upon the bases that they be recognized singers of Italian operatic literature, and that their singing be available upon modern high fidelity disc recordings. From these operatic recordings, 545 samples were selected and transferred to magnetic tape. Examples of each singer's production of each of the four vowels [a], [e], [i], and [o] on three pitch levels (low, middle, and high; different pitches for each voice type) were represented.

Each sample was analyzed by a sound spectrograph, from which a visual record or graph of the harmonic components of each tone was obtained. The acoustical analysis was reinforced by presenting all of the samples to a jury of trained phoneticians who were asked to decide what vowel was sung in each sample.

Findings. With the exception of one singer performing the vowel [e], all singers showed significant changes in formant frequencies on all vowels at the three pitch levels. By far the most significant changes in formant frequencies on all vowels were found between the highest and middle pitches. Formant frequencies for the lowest pitches were always near to the frequencies of the spoken vowel.

The findings showed that each voice type has a pattern of modification for each vowel which is peculiar to that voice type. In general, the findings indicated that tenor vowels are more open and bright than are baritone vowels. Further, it was found that the specific pitch upon which the vowel is sung is less important to vowel modification than the position of that pitch in the vocal range.

The findings of jury analysis were: the jury showed considerably greater agreement upon the lower pitches than upon the highest pitch, a result which would support the conclusion that the vowels sung upon the highest pitches were different from those sung upon the lower pitches; in a comparison of individual samples, results of jury analysis showed little agreement with the results of spectrographic analysis except upon the [i] vowel.

Microfilm \$2.60; Xerox \$9.00. 198 pages.

AN EVALUATION OF TESTS GIVEN TO INTERRELATE INTELLIGENCE, AURAL ACUITY AND MUSICAL ACHIEVEMENT FOR PURPOSES OF PROGNOSIS IN EAR-TRAINING.

(L. C. Card No. Mic 60-447)

James Kilford Neely, Ph.D.
Northwestern University, 1959

Chairman: Frank Cookson

The purpose of this study was to seek to establish a new method of prognosis in the field of ear-training. It was hoped that through the interrelation of three types of tests a correlation of performance or ability could be found. The three types of tests are musical achievement, intelligence and aural threshold. Standard intelligence and threshold tests were used, and the musical achievement test was designed by the author of the dissertation.

The freshman ear-training class at Northwestern

University, Evanston, Illinois, was the study group. The testing period covered two quarters. The musical achievement test was given at the beginning and again at the end of the testing period for the purpose of judging progress overall and in each of the several areas under study. During the testing period, tests were given on an average of every two weeks, and the scores on those tests were kept in such a manner that a student's total score for any given test, or his score in any of the individual parts could be seen at a glance. The averages of these scores were then arranged into decile or quintile groupings in thirteen different ways in order to facilitate comparison with mental or aural acuity.

The results of this study indicate that there is a definite and positive relationship between a person's aural acuity at a certain specified frequency level and his response to the phase of ear-training having to do with pitch and harmonic structure, and a definite and positive relationship between mental facility and his response to the phase of ear-training involving rhythm.

Because of the conditions under which this study was made, these figures cannot be taken as conclusive evidence that these same results will be true in every case. It is quite possible, however, that they do point to a new and more effective way of achieving prognosis in ear-training.

Microfilm \$2.00; Xerox \$4.80. 92 pages.

SIXTH-GRADE CHILDREN'S ATTITUDES TOWARD MUSIC OF GLUCK, HAYDN, MOZART AND TOWARD OTHER MUSIC.

(L. C. Card No. Mic 59-5318)

Minerva Pepinsky, Mus. Ed. D.
Indiana University, 1959

This study was an exploration of the relationship between sixth grade children's experiences at school with music of Gluck, Haydn, and Mozart and the children's liking for (1) selected items, (2) other music of these composers, and (3) music in general. A curricular program of Gluck, Haydn, and Mozart music was presented during daily twenty-minute music periods for one semester to a class of twenty-four sixth grade children at McMurry Laboratory School,¹ Northern Illinois University. The curriculum was based on a five-fold activity plan that included singing, reading music, listening to music, playing musical instruments, and participating in rhythmic exercises, with creativity underlying all endeavors.

A music attitude test devised by the investigator was given before and after the experiment to determine the effectiveness of the curriculum. The Attitude Test was divided into two parts. Part I indicated the degree of the children's liking for excerpts from six compositions presented in the curriculum and for excerpts from six lesser works paired with the master ones. Responses to each excerpt were made on the basis of a five-point attitude scale ("like it very much, like it, undecided, dislike it, and dislike it very much"). Preferences could also be indicated for the paired items. Part II, a questionnaire, indicated the degree of the children's liking for music in general. After the experiment, an extension of the Attitude Test was given, known as the Extended Test. This was similar to

Part I of the Attitude Test except that the Gluck, Haydn, Mozart and Lesser excerpts were from compositions unfamiliar to the children. The data were quantified by (1) assigning numerical values to all responses and (2) obtaining scores, sums of the numerical values. Daily observations of the children's behavior during the experiment were recorded.

In the course of the study, six secondary relationships were also investigated: changes in the children's attitudes and their (1) musical aptitude, (2) musical background, (3) socio-economic background, (4) intelligence, (5) scholastic achievement, and (6) personality. A questionnaire devised by the investigator was used to determine each child's musical background. Standard measures were used to learn each child's standing in the other factors. Each child's status in his group was determined for all factors involved. A system of rank order correlations was then applied to the children's group status in any two factors to determine the relationship between them.

The data were presented (1) in twenty-four case studies and (2) on a group basis.

Findings showed:

(1) All of the children seemed to enjoy the music of the curriculum.

(2) All gained in their liking for music in general.

(3) All registered liking for music taught at school and for similar unfamiliar music, except two children antagonistic toward all music before the experiment.

(4) The group improved in musical taste.

(5) The children's attitudes toward music of Gluck, Haydn, Mozart and toward other music seemed to be more closely related to musical experiences than to any other factor studied.

Microfilm \$8.40; Xerox \$29.95. 662 pages.

¹ Now called "Northern Elementary and Junior High School."

THE CONCERTO FOR ORGAN AND ORCHESTRA

(L. C. Card No. Mic 60-396)

Richard Henry Satorius, D.M.A.
University of Southern California, 1959

Chairman: Professor Rush

It was the purpose of this study (1) to examine both the historical and musical influences which led to the gradual evolution of the organ concerto form; (2) to bring to light a considerable portion of heretofore neglected organ concerto literature; (3) to provide organists, teachers of organ, and orchestral conductors with an annotated catalogue of such works; and (4) to evaluate certain factors which have seemingly contributed to the neglect of organ concerto performance within the present century.

Solo literature for organ developed as early as the fourteenth century, and since many of these works are occasionally performed, being still available in published editions, they remain comparatively well known. Concerted and instrumental ensemble literature for organ, emerging in the late sixteenth century, has not enjoyed as extensive performance as the solo repertoire. The author's

investigation has revealed the existence of innumerable concertos for organ and orchestra as well as for organ in combination with varying ensembles of instrumental accompaniment.

By 1725 conditions were ideal for experimentation with the organ concerto. Several factors which contributed to this situation were (1) the mechanical development of the organ, which had been brought to a high level of perfection as exemplified in the superb instruments of the German organ builders Schnitger and Silbermann; (2) definite establishment of those musical forms which comprise the very core of organ literature; (3) in addition to its basso-continuo function, the enviable status gained by the organ as an effective solo instrument. Moreover, it was inevitable that the latter seventeenth century penchant for virtuosity, which became more pronounced throughout the early eighteenth century, would eventually include keyboard instruments as mediums of soloistic exploitation.

Handel's secular oratorio *Il Trionfo*, composed at Rome (circa 1708), contains an instrumental sonata which represents the earliest example, in embryonic form, of an accompanied organ concerto. The first recognized keyboard concerto, however, is Bach's Fifth Brandenburg, composed in 1721 during the Coethen period. It was at a later date (1732-33) that Handel established a fully developed organ concerto medium by the interpolation of these instrumental works between the principal divisions of the oratorios *Esther* and *Deborah*. The performances of Handel's concertos captivated London audiences. Soon his colleagues

were composing organ concertos in large quantity. As a result, there was an extraordinarily vast repertoire of such works written in eighteenth century England.

Continental Europe's contribution to eighteenth century concerted organ literature was less extensive. Bach's legacy in this area consists of "sinfonias" which serve as instrumental preludes to five of the cantatas. Frantisek Brixl (1732-1771), a Czech composer of singularly Mozartian traits, wrote three concertos for organ, cembalo, and small chamber orchestra. Franz Joseph Haydn also experimented with the organ concerto form. He composed three works in this genre, the first two of which are currently extant.

Nineteenth century organ concerto composition was adversely affected by several conditions: Cavaille-Coll's creation of the "symphonic organ," the persistent and growing interest in new symphonic forms, and a continued preoccupation with the development of national opera.

The twentieth century has witnessed a recrudescence of interest in organ concerto composition. American composers who have significantly enriched the repertoire include Aaron Copland, Leo Sowerby, Howard Hanson, and Normand Lockwood. There is even greater compositional activity in several European countries. Contemporary composers of Germany, Holland, Sweden, and Switzerland are convincingly demonstrating the effectiveness of the organ concerto as a vital medium of musical expression.

Microfilm \$4.90; Xerox \$17.35. 382 pages.

PHARMACOLOGY

STUDIES OF CATIONIC EXCRETION BY THE KIDNEY, INVESTIGATIONS OF THE AMNESIC PROPERTIES OF SCOPOLAMINE AND SYNTHESIS AND METABOLIC STUDIES OF HEMICHOLINIUM NUMBER THREE.

(L. C. Card No. Mic 60-359)

Floyd Ray Domer, Ph.D.
Tulane University, 1959

Chairman: F. W. Schueler

Force-feeding of potassium to dogs is one of the ways in which secretion of potassium by the renal tubules has been demonstrated. A modification of this technique was employed in the present experiments. Standard clearance experiments were carried out before and after a period of force-feeding of the organic bases: N-methylnicotinamide (NMN), tolazoline (Priscoline) and mepiperphenidol (Darstine). The procedure resulted in an increased ability of the tubule cells to secrete NMN and Priscoline but no enhancement in the handling of Darstine. In similar experiments there was an increased ability of the tubules to handle mecamlamine (Inversine) after the force-feeding of potassium. In most cases following the force-feeding period the resting rate of potassium excretion was diminished from that before force-feeding. These results show that either force-feeding with an organic cation or potas-

sium will result in an increased ability of the renal tubule cells to secrete the organic cation. Additional studies with diuretics and 9- α -methyl-fluoro-hydrocortisone were employed to study the effects on cationic excretion in the kidney.

A screening procedure to test the amnesic properties of scopolamine and other compounds was devised. The method used was that of allowing dehydrated rats to solve a multiple-T maze problem. The rat was given an intraperitoneal injection of the test compound and again allowed to solve the maze problem. The number of errors and time required to solve the problem were recorded. Using this procedure scopolamine, atropine, benactyzine (Suavitil), N-ethyl-3-piperidyl benzilate (JB318) and N- β -chloroethyl-diphenyl acetamide all produced amnesia effects. In a series of pharmacological screening procedures the N- β -chloroethyl-diphenyl acetamide was found to block the action of acetylcholine in various tests.

Hemicholinium number three (HC-3) is a very potent compound which causes death by respiratory depression. The death characteristically occurs only after a period of time has elapsed. Previous investigations have indicated two possible primary sites of action, i.e. central or peripheral. In an effort to clarify this problem carbon-14 labeled HC-3 was synthesized. The specific activity of this compound was 2.788 mc/mM. Routes of excretion were determined in rats placed in all-glass metabolism

cages. The HC-3 was found to be very rapidly eliminated in the urine and feces (approximately in a 3:1 ratio). No radioactivity was found in the expired carbon dioxide. In studies of representative organs of the rat the C^{14} activity at the height of intoxication was found to be highest in the kidney, liver and spleen. Autoradiographs indicated the radioactivity in the kidney was highest in the renal pelvis and around the cortex or capsule of the kidney. These studies indicate HC-3 is not concentrated to any significant degree in the brain.

Microfilm \$2.40; Xerox \$8.40. 181 pages.

**A STUDY OF THE CONTRACTILE RESPONSES
PRODUCED IN RAT AND GUINEA PIG MYOCARDIUM
BY ALTERATIONS IN STIMULATION FREQUENCY
AND BY QUINIDINE, COCAINE, AND PROCAINE.**

(L. C. Card No. Mic 59-6396)

Robert W. Earle, Ph.D.
University of Southern California, 1959

Chairman: Professor Webb

The phenomena of treppe, postextra systolic potentiation, and postquiescent contractions, as they appear in the myocardium, have been the subject of numerous investigations. The expectation was that such studies would yield some insight to mechanisms linking excitation with contraction. The various hypotheses advanced have dealt with the phenomena either as separate entities or as different manifestations of the same basic process. This investigation was initiated to characterize conditions under which the phenomena could be produced and to determine applicability of the hypotheses concerning their origin.

Except for the rat, myocardial tissue from various species responds in the same general fashion to situations evoking these phenomena. Since the concepts regarding treppe, etc., have been developed on species with similar responses, it was expected that the rat would supply a critical test. It was also anticipated that certain drugs would cast further light on the subject.

Electrically driven right ventricular strips from rat and guinea pig myocardia were arranged in a thermostatically controlled bath for suitable recording of tensions developed as contraction occurred. After equilibration, responses of the tissues to situations evoking treppe, postextra systolic potentiation, and postquiescent contractions were determined. It appeared that the most information could be obtained from a study of postquiescent contractions. Accordingly, the effect of variation in stimulation frequency, voltage, and rest duration was investigated. Alterations produced by changes in temperature, potassium ion concentration, and the effect of quinidine, cocaine, and procaine were also determined.

In general, the rat was found to exhibit negative treppe with increased stimulation frequency, while positive treppe occurred in the guinea pig. Postquiescent contractions of rat showed negative treppe, while in the guinea pig positive treppe was observed following the first contraction. Postextra systolic contractions of both species showed positive treppe.

Application of experimental observations to various

hypotheses revealed that the most useful explanation involved a potentiating substance released at the cell membrane and acting upon the cellular contractile mechanism. Analysis of factors resulting in appearance or disappearance of potentiating substance suggested that appearance could be due to synthesis and/or release from a binding site, while disappearance could be through utilization, destruction, diffusion, and binding. Amplitude of any particular contraction would then be a balance between these factors. In light of data acquired on the guinea pig, it was concluded that potentiating substance appears during rest as well as activity and the amount produced during activity depends upon the rate of contraction, greater amounts being produced at greater rates. The potentiating substance produced during rest depends upon previous activity and the rest duration; greater activity produced greater amounts, longer rest periods produced less. Temperature affected the amount of potentiating substance present due to an enhancement of what appeared to be an enzymatic reaction.

Similarities between both species suggested that the rat utilizes the same basic system as the guinea pig. Dissimilarities suggested that the rat lacks as effective a mechanism for removal of the potentiating substance, but it also possesses a more active storage facility.

The action of quinidine and cocaine lends support to the potentiating substance hypothesis and also raises the possibility that the metabolic effect of these drugs is more important at lower concentrations than had been assumed. Quinidine is postulated as having a metabolic effect which interferes with synthesis; cocaine decreases activity of the potentiating substance removal mechanism, while the action of procaine is postulated as increasing the amount of potentiating substance released.

Microfilm \$2.50; Xerox \$7.00. 147 pages.

**SEROTONIN INTERACTION WITH THE ADRENALINES
ON PHYSIOLOGICAL MECHANISMS**

(L. C. Card No. Mic 60-432)

Paul Gordon, Ph.D.
Northwestern University, 1959

Published experiments have suggested that a functional relationship may exist between serotonin and natural catecholamine, in vivo. These have concerned 1) evidence of the structural similarities between serotonin and the adrenaline, 2) evidence of interaction between serotonin and these compounds on several isolated test systems, specifically the rabbit aorta strip, the rat mesoappendiceal blood vessels, the estrus rat uterus, the guinea pig bronchial musculature, by inference, the dog forelimb small vessels, and, the mouse, rat and rabbit adrenaline toxicity and pulmonary edema manifestations. In such experiments the interaction was revealed as a response potentiation or inhibition depending on the doses, conditions, and test system. Such findings strongly indicate that serotonin-adrenergic interaction is a physiological reality but reveal only a few adrenergic systems on which it has been observed in the living animal. The diversity of systems on which serotonin-catecholamine interaction may exist and the importance of this effect to control of adrenergic mechanisms have remained unknown.

Thus, as the research of this thesis, a study was made of the capacity of serotonin to modify the responses to adrenaline and noradrenaline of a group of classic adrenergic mechanisms. These were:

- 1) In the mouse, the pilomotor response, evoked by cold, reserpine, noradrenaline, and adrenaline injection.
- 2) In the anesthetized dog, the heart rate and systemic blood pressure increase following adrenaline and noradrenaline, and the forelimb small vessel resistance, with tone varied by intraarterial infusion of noradrenaline.
- 3) In the rat, modifications of blood sugar, liver and muscle glycogen.

The following was observed: 1) adrenergic action on the pilomotor muscles of the mouse was reversed by serotonin; 2) noradrenaline constriction of the dog forelimb arterioles was inhibited by serotonin and noradrenaline was able to reverse this inhibition; 3) adrenaline and noradrenaline reflex bradycardia was interrupted by serotonin, allowed expression of local adrenergic action on the heart; 4) the systemic pressure response to adrenaline was po-

tentiated by serotonin; the response to noradrenaline was not; 5) a moderate dose of serotonin and adrenaline were additive in their effects on the blood sugar of the rat. A larger dose of serotonin and adrenaline were subtractive in these effects; 6) serotonin at both doses inhibited the delayed adrenaline increase in liver glycogen; 7) adrenaline lowered muscle glycogen in the presence of the lower serotonin dose to a value intermediate between the high value achieved by serotonin and the low value achieved by adrenaline alone. Adrenaline treatment elevated the more marked muscle glycogen lowering of the double dose of serotonin to its own value.

It is concluded that serotonin does have the capacity to modify the actions of adrenaline and noradrenaline on common adrenergic mechanisms.

It is further concluded that on systems modifying the muscle glycogen these agents interact in a competitive fashion. This view is compatible, as well, with results obtained on the small-vessel bed.

Microfilm \$2.50; Xerox \$4.80. 93 pages.

PHILOSOPHY

AN ANALYSIS OF THE CONCEPT OF DEFINITION, AND CRITIQUE OF THREE TRADITIONAL PHILOSOPHICAL VIEWS CONCERNING ITS ROLE IN KNOWLEDGE.

(L. C. Card No. Mic 60-488)

Raziel Abelson, Ph.D.
New York University, 1957

Adviser: Professor Sidney Hook

Three traditional Philosophical views of definition are critically examined in this work, all centering around the problem of whether or not definitions convey information, and, if so, what kind of information they convey. Classical and modern philosophical writings on the subject of definition are examined, and classified under "essentialist," "prescriptive," and "linguistic" views. The merits and shortcomings of each are indicated, and a contextualist approach to the problem is then outlined, and shown to reconcile the insights of the traditional theories.

The problem of defining definition itself, accounting for its role in inquiry, and formulating criteria for evaluating definitions is stated in the introductory chapter of this work, and the general procedure to be followed through the work is then described.

In chapter I, the Socratic inquiry into definitions is examined. Tentative interpretations are made as to what Socrates meant by definition and the criteria by which he evaluated them, and difficulties are pointed out with respect to each such interpretation. It is then suggested that these are problems which Socrates brought attention to but did not solve.

In chapter II, the views of Plato, Aristotle, Locke, Kant, and several contemporary philosophers are discussed, as

variations of the "essentialist" view that definitions convey descriptive information about a special realm of entities. Each form of essentialism is shown to rest on a metaphor, the Platonic view on the metaphor of an unseen model, the Aristotelian view on the metaphor of an internal cause, and the others on various forms of the metaphor of a private world. Each metaphor is analyzed and shown to be, on the whole, misleading rather than fruitful.

Chapter III consists of an examination of prescriptive views of definition, which identify definitions with assignments of names or assignments of notational abbreviations, or both. The views of Bacon, Hobbes, Pascal, Russell and Whitehead, Quine, Goodman, Carnap and Hempel are criticized as excessively conventionalistic and formalistic, and as unable to provide clear criteria for distinguishing good definitions from bad.

Linguistic views of definition, while relate definitions to the meanings and usage of words, are discussed in chapter IV. Writings of J. S. Mill, G. E. Moore and Richard Robinson are criticized either for confusing meaning with fact and concepts with objects, or for reducing definitions to reports of language behavior.

In the concluding chapter, a contextual theory of definition is outlined, in terms of which definitions can be understood as providing a special kind of information, which consists of rules governing the uses of words. Definitions are compared to value judgments, and shown to be, like value judgments, a class of normative assertions. The general types of discursive contexts, relatively to which the rules of use conveyed by definitions can be evaluated as effective or ineffective are classified, and criteria for such evaluation are proposed. Finally, conclusions are drawn vindicating philosophical analysis as a unique and indispensable mode of inquiry.

Microfilm \$2.55; Xerox \$8.80. 194 pages.

ARISTOTLE'S THEORY OF BEING

(L. C. Card No. Mic 59-6998)

Emerson Buchanan, Ph.D.
Columbia University, 1959

It must be apparent to any reader of the Greek text of Aristotle's writings that the terminology employed in the Latin tradition for the translation and discussion of Aristotle's metaphysics does not exactly correspond to Aristotle's Greek terminology. This is conspicuously so for the word which designates what may be called the central concept of Aristotle's metaphysics--viz., *ousia*. *Ousia* has been translated, or rather replaced, by *substantia* and its vulgar derivatives. This discrepancy in terminology has been partly responsible for some inadequacies in the interpretation of Aristotle's doctrine.

The purpose of the present dissertation is to present an interpretation of Aristotle's theory of *ousia*, principally as it appears in Books VII-IX of the *Metaphysics*, which is based on the assumption that Aristotle's terms are to be taken literally--i.e., in their plain, etymological meanings. The terms principally involved are three: *οὐσία*, *τὸ τί ἦν εἶναι*, and *ἐνέργεια*.

It is suggested that Aristotle in his metaphysics continues the search for being which he inherited from his predecessors, particularly Parmenides and Plato; and that *ousia*, which represents the fundamental type of being, is Aristotle's substitute for Parmenides' "being" and Plato's "Being itself." The concrete individual is called a Being (*ousia*) because, as something which is or exists simply and not as a predicate of something else, it has Being, and hence is the locus where Being is to be sought. Matter is Being because as such it is a potentiality for Being; and prime matter, as the potentiality for all natural Beings, represents the fact that each of the elements of which natural Beings are composed can be transformed into any other element. Being (*ousia*) as the form of the concrete Being is Being itself, or existence. It is what it is for each thing to be (*τὸ τί ἦν εἶναι ἐκάστῳ*), and differs from one species to another, so that it may also be called the specific mode of existence of the individual. Finally, Being (*ousia*) is act, or activity (*energeia*); so that the Being of a thing, or what it is for the thing to be, is the fundamental principle of its activity, or rather its activity regarded from the point of view of its fundamental principle as a single, persistent act rather than as a succession of events.

Microfilm \$2.50; Xerox \$5.60. 111 pages.

DIVINE INFINITY ACCORDING TO
ALBERT THE GREAT'S COMMENTARY
ON LOMBARD'S SENTENCES

(L. C. Card No. Mic 60-324)

Francis Joseph Catania, Ph.D.
St. Louis University, 1959

This study of Saint Albert the Great attempts to answer the following question. Where does Albert, in his Commentary on the Sentences of Peter Lombard, stand with respect to divine infinity? Does he, as does his pupil St. Thomas Aquinas, predicate infinity of the very being of God,

or is he more in line with earlier theologians who either were silent concerning infinity or considered infinity as extrinsic to the divine being?

Nowhere does Albert directly ask *Utrum Deus sit infinitus*. We suggest that the absence of this question indicates not that he considered the attribute unimportant, but rather that he considered it to have no proper meaning entirely apart from the meanings, say, of immensity, eternity, and the like, since divine infinity is discussed only in such contexts as the Beatific Vision, eternity, the Trinity, divine generation, equality of divine Persons, production of possibles, and the knowledge of Christ's soul.

The main lines of Albert's doctrine may be drawn as follows. 1) God is infinite through extrinsic denomination. His power is so great as to be able to cause an infinite number of things, and His wisdom is so extensive as to embrace all in His power. Such infinities are quantitative and only potential, and infinity is applied to God with reference to them and not intrinsically. 2) God is infinite by negation. He cannot be limited or contained by anything outside Himself, and so with respect to creatures, He is infinite -- that is, unlimited. 3) God is infinite as transcending the determination proper to the being and knowledge of creatures. A twofold composition of creatures indicates a multiplicity of distinct principles (*esse*, *aliquid*, *quod est*) whereby creatures are specified and determined. Since God does not have this multiplicity of principles, He is without the consequent determination. Divine simplicity appears to be the key to understanding this transcendence.

Hence, we may say that infinity is extrinsic to divine being and power. In fact, considered in Himself and in His intrinsic perfection, God is most finite in two ways. He embraces His whole reality in being and knowledge and thus contains Himself; and as the *finis* of all creatures, He must Himself be *finitus*. Basic to these notions is that God is most perfect, and formal perfection carries with it finitude, determination, and "definiteness."

Albert received his basic notion of quantitative infinity from Aristotle, his notion of being from Boethius, his notion of negative knowledge of God from John Damascene. In addition, his doctrine of divine transcendence is quite similar to the infinite non-being of Plotinus's One.

That the influence of Aristotle was the most extensive may be evidenced by the role which quantity plays in Albert's notion both of infinity and of finitude. These characteristics have proper meanings as connected with composite items and are applied to God only in an extended and deeply analogous sense. Thus, God is infinite in that He is always beyond any attempt to contain Him or His power, and He is finite in that He functions for Himself as a *finis* functions for a creature.

Microfilm \$4.25; Xerox \$15.10. 332 pages.

AN ANALYSIS AND EVALUATION OF SOME THEORIES
OF EVIL: PLOTINUS, AQUINAS AND LEIBNIZ.

(L. C. Card No. Mic 60-425)

Edward B. Costello, Ph.D.
Northwestern University, 1959

This is an investigation of the nature and causes of evil through examining some of the major distinguishable

treatments of questions centered about these topics. Although the theories examined are drawn from the history of philosophy, our interest is not primarily historical.

As for the nature of evil, it is asked whether it can be fully described in a strictly metaphysical context or whether it must be grounded in an ethics. Also, since many so-called evils can be shown to be merely apparent evils, are there any authentic evils at all? If there are, how are these related to the apparent evils?

As for the cause of evil, there seems to be a dilemma. If one vindicates God by making all evils inevitable, all evils become merely apparent evils. This means that love or sympathy is deceitful, at least insofar as it insists that human tragedy is a real evil. But if evils are not considered inevitable, if they are not considered the necessitated results of causes, or if the causes are not themselves considered the necessitated results of anterior causes, a causal account of evils is impossible for it must include a causally inexplicable factor.

The investigation of some of the treatments of these problems leads first into the theory of evil of Plotinus. Evil is shown to depend on a refusal of an orientation to the One, the neoplatonic Good. Evil is real only when this refusal is free, absolutely unconditioned and causally inexplicable.

Evil in its strict sense can appear only in a context of a free choice of orientations, which means a purely ethical context. But there are two other senses in which he speaks of evil. Since his metaphysics considers matter as the passive ground of determinability *ab alio*, he can call matter the "essentially other than form." Since matter's metaphysical function makes it do necessarily the refusing which is evil for a soul to do freely, matter is said--by analogy only--to be the supreme evil or evil in its pure form. This is why an evil soul is said to have attained likeness, or an orientation, to matter. Anyone who has made this evil orientation is likely to call pain, disease and the like "evil" but this third meaning of the term is contemptibly illusory.

For St. Thomas Aquinas evil is again a primarily ethical term and again its cause is undiscoverable. Since a Thomistic *ens* has *esse* only through exerting acts, Thomas' equivalent to Plotinus' orientation is the accord or discord any act has with the rules for action found in divine or natural law. Man need not have the law in mind at all times but when he proceeds to an act without consulting the law which alone can give the act rectitude, he wilfully transforms this "mere lack" (non-consultation of law) into a "lack of a due good" or an evil. Thomas warns against looking beyond this radical freedom of will for the cause of genuine evil.

Reasons are given for considering Thomas' two other "evils"--*malum naturae* and *poena*--as merely apparent by analogy and as derivatively ethical, respectively.

An attempt is made to show that Leibniz' grounding of evil in metaphysics invalidates his theory of evil, makes "good" meaningless, rules out love and severely damages his ethics.

The dissertation yields no new theory of evil. It simply tends to confirm the principle that no evil is necessary, and it hints that without real, non-necessary evil there can be no love.

Microfilm \$2.50; Xerox \$6.60. 140 pages.

THE DOCTRINE OF FOUR TERM ANALOGY IN ARISTOTLE

(L. C. Card No. Mic 60-328)

Howard Raymond Delaney, Ph.D.
St. Louis University, 1959

As the title of this dissertation has indicated, the problem considered was that of a doctrine of analogy in the works of Aristotle. In order to initiate such a study the primary goal of this dissertation was established as that of collecting and ordering all references to analogy throughout Aristotle's works. The secondary goal consisted of an interpretation of those analogies. This was an attempt to identify the type of relationship or proportion functioning in a given instance.

The primary goal was accomplished by listing all of the pertinent passages in the order in which they occurred in each treatise. With respect to the secondary goal, that is, the matter of interpretation, the early biological and physical works seem to have anticipated the mature notion of analogy found later in the *Metaphysics*. And in one aspect, namely, the insistence that the nature of any being is intrinsic to that thing, all of these works strike one of the great continuing themes which Aristotle directed against Platonism. This theme, that the perfections of being are intrinsic to it, is the philosophical basis of Aristotelian analogy.

The early treatises employ the term 'analogy' to indicate situations involving two or more ratios. This was the common Greek notion of the term 'analogy' and its use was restricted to the expression of quantitative ratios. Aristotle himself used the term in a much broader sense even in his early biological and physical writings. In fact the vast majority of situations which Aristotle described as analogous were those involving generic diversity in the biological meaning of 'genus.' It is noteworthy that throughout the Aristotelian treatises the term 'analogy' continues to signify a situation involving four terms in two distinct ratios. This was not true in later scholasticism.

The *Physics* adhered to the conditions of analogy established in the early works. And, if anything, there seemed to be a deeper appreciation of analogy. This was evidenced particularly in Aristotle's growing awareness of the function of causality within a doctrine of analogy.

The *Metaphysics* and ethical treatises present the culmination of the story of Aristotelian analogy. The *Metaphysics* especially seemed to indicate, not only that being was analogous in nature, but that causality was the structuring force within the nature of analogy. This element was emphasized by causal analogies within beings and analogies between them.

The ultimate philosophical basis for this Aristotelian concept of analogy seemed to flow from two great relations. The first consisted of the relationships manifested in the internal structure of Aristotelian being, that is, the act-potency correlation of principles within mobile things. This internal structure manifested itself in the relations of substance and accidents as well as those of form and matter. The first set of principles led into the somewhat similar analogies found in the division of being into the

ten categories and those flowing from final and efficient causality. The second set of act-potency principles, form and matter, led into the analogically similar analogies found in nature and operations, the kinds of substance, and, generally, formal and material causality. The external manifestations of Aristotelian analogy consist of the analogies between beings. The classic instance of such an external relation is the relationship of God and mobile being.

Microfilm \$2.90; Xerox \$10.15. 222 pages.

A STUDY OF THE OBJECTIVE AND SUBJECTIVE ASPECTS OF SELFHOOD IN THE THOUGHT OF ALFRED NORTH WHITEHEAD

(L. C. Card No. Mic 60-8)

Ivan Eugene Frick, Ph.D.
Columbia University, 1959

The present study investigates the basic metaphysical ideas of Alfred North Whitehead, his conception of the objective and subjective aspects of selfhood and, finally, evaluates the significance of this conception of selfhood.

Whitehead's basic ideas stem from his notion of the actual entity, a unit of activity. Every unit and society of activity have objective and subjective aspects. The final stage of development of every unit is produced by the interplay of its objective and subjective factors. The human person, Whitehead thinks, is composed of societies of actual entities. The central dominant society, personal order, coordinates all levels of experience in the self.

Whitehead analyzes the objective side of the human personality in terms of "the actual world," "ideal entities" and "God." These objective aspects possess creativity, power, potentiality, eternality, and order.

In this analysis, the "actual world"--a community of entities, the systematic background of the universe of experience--is the objective content for each new unit of activity. The "actual world" is the given, the world of stubborn fact.

The "ideal entities" constitute the "realm of possibility." These entities contribute to the emergence of the qualities of endurance, recurrence, value, worth, pattern, character, aims, aesthetic contrasts, unification of experience.

God is in the world of activity objectively, grading the ideal entities, producing order and valuation, flooding the world with love and persuasion.

The characteristics of the subjective side of human selfhood are derived mainly from the subjective aspects of personal order. The members of personal order are arranged serially.

The unity of the self in Whitehead's thought is the creation of the combined efforts of the following factors of experience: the "subject" and "subjective form" of the society of personal order, the self-determination of that emerging society, God, the subjective ideal of the self which is a hybrid prehension, and the "receptacle" or space-time continuum in which the self lives.

The freedom of the human self is the freedom of action, the action of those factors which create the unity of the self. God, appealing to the subjective aspects, plays a large part in calling forth this freedom. In the end, the

freedom of self comes into being in contemporary units of experience in the higher origination phases. All freedom emerges in the midst of the conditioning factors of objective aspects of experience.

Objective and subjective aspects, intertwining to produce the self, do not constitute a split in the human self.

The significance of Whitehead's view can be assessed in an analysis of what it offers to the understanding of selfhood and to a Christian conception of the relation of person to community.

Whitehead's view depicts the structure of self as an objective-subjective complex, avoids the splitting of the self into separate faculties, partly explains the uniqueness of selfhood on the basis of the uniqueness of each unit of activity or society of activity, considers the social aspects of selfhood and offers a metaphysical context in which the entire discussion can take place.

Whitehead's view can be used to analyze and state a Christian doctrine of the church. In his terms, community has objective factors: a substratum composed of natural and social units of experience. The Christian church also has its objective aspects: creeds, the Bible, traditions, liturgies and its historical past. In Whitehead's terms, community is also formed by subjective factors: speech, reason, and decision. The Christian church has its subjective aspects: life in the present. Understanding of the objective and subjective aspects of the church can be obtained by analyzing them with the aid of Whitehead's metaphysics. Microfilm \$3.40; Xerox \$11.95. 261 pages.

HUME'S THEORY OF SENSE PERCEPTION

(L. C. Card No. Mic 60-337)

William Stanley Haymond, Ph.D.
St. Louis University, 1959

The aim of this work is to show that Hume's phenomenalistic theory of sense perception is an outgrowth of an underlying assumption that things in *rerum natura* have essentially the same behavior, the same distinctions, and the same general structure as concepts in the mind; and that this "logicism" of his thought forces Hume into a "scepticism with regard to the external senses," as he puts it. Hume's theory of sense perception takes as its starting point the belief that sense perceptions are radically subjective and atomic in character. Consequently, external objects as such cannot be directly given to the senses, but must be "constructed" by the imagination (both in their externality and in their wholeness as objects), out of the fragmentary data of the senses by means of an association-of-ideas mechanism within the perceiver. This constructive activity, Hume believes, forces belief in an external world on the consciousness of the perceiver; but Hume's empiricist principles are unable either to explain how this persuasion is to be effected, or even to provide any evidence of such activity. He, accordingly, finds himself forced into the "egocentric predicament."

Such is the situation set for Hume by Locke's "new way of ideas," the guiding principle of British Empiricism. But the extreme atomism of "the new way" itself presupposes a philosophical attitude which tends to treat objects and their properties as if they were concept-like entities.

In a word, the orientation of Hume's thinking in perception was determined, more ultimately, by Cartesian rationalism, which was only superficially altered by his British predecessors, in their rejection of Cartesian innatism. Accordingly, Hume's philosophy may be characterized as an "empiricized rationalism"; and there the source may be found for the basic flaws in his theory of perception.

Microfilm \$2.75; Xerox \$9.70. 211 pages.

THE PROBLEM OF VALUE APPREHENSION

(L. C. Card No. Mic 60-441)

John Prescott Johnson, Ph.D.
Northwestern University, 1959

The purpose of the argument is to demonstrate that value possesses ontic status and is amenable to a distinctive mode of valuational cognition.

The argument takes note of the fact that the disposition of the categorial questions of value objectivity and value apprehension may be made in terms of pre-determined criteria of meaning. Thus, empirical, idealist, and realist criteria of meaning are expounded with respect to their import in the construction of respective axiologies. It is shown that empirical, idealist, and realist axiologies do not secure an adequate account of value objectivity and value apprehension, for the reason that they are premised upon criteria of meaning which are unsubstantiated as regards their metaphysical and epistemological adequacy.

The ontic status of value--indeed, the ultimate identity of being and value--as independent of the conditions of thought is demonstrated in a manner which, at the crucial phase, is free from the prejudicial effects of a concept of meaning. The demonstration is achieved in terms of a formulation of the ontological argument which involves a subjective departure, such that both the phenomenality of consciousness and the integrity of ontic value as objectively transcendent to the phenomenological context are duly respected.

The *sui generis* mode of cognition which alone answers to value is propounded and explicated. Valuational cognition requires a distinctive involvement on the part of the subject and is therefore peculiarly qualified internally as self-authenticating and indubitable. The precise respect in which the objective question of validity is appropriate to the apprehension of value is specified. Here it is demonstrated that the rational certification of the objective absoluteness of value which the ontological argument procures constitutes an indirect and partial, but indecisive, certification of the validity of valuational apprehension as securing closure with axiological reality.

Microfilm \$3.50; Xerox \$12.40. 272 pages.

JOHN LOCKE AND THE OXFORD TRAINING IN LOGIC AND METAPHYSICS

(L. C. Card No. Mic 60-339)

W. Henry Kenney, S.J., Ph.D.
St. Louis University, 1959

Several Lockean scholars have attempted to expose the intellectual lineage of Locke's philosophy through internal criticism; they point out similarities between some of Locke's positions and those of medieval and post-medieval authors, concluding that Locke must have had acquaintance with some of the great scholastic thinkers. Prior to the Bodleian Library's purchase of the Lovelace collection of Lockean manuscripts, it was impossible to be sure of Locke's intellectual contacts with previous philosophical writing.

This dissertation makes use of several of Locke's notebooks where definite reference is made to authors of textbooks used. Corroboration and extension of this evidence are gained from the notebooks of other Oxford students and by a survey of the philosophical books published at Oxford at this time. These give genuine sources of Locke's philosophical training at Oxford.

The dissertation directs attention especially to the nature of the logic and metaphysics which were taught at Locke's Oxford; it studies in particular the doctrines of substance and the explanations of the relation between sense and intellect.

The logic which Locke studied is found to be the core of the philosophy curriculum and was taught by means of jejune manuals which propound a logic of terms rather than a logic of propositions. The division of logic manuals is into three parts (terms, propositions, syllogisms); these parts correspond to the three acts of the mind (simple apprehension, judgment, reasoning). Involved in and propagated by this method was a mechanistic theory of knowledge whereby the process of knowing is seen as very similar to the joining or separating of distinct material units.

One finds in the metaphysics textbooks a method dominated by a type of terminism. The authors begin with definitions of words and then proceed to show the necessary deductions that can be made from them. First principles are, accordingly, seen to be completely analytic propositions.

In the explicit but passing treatments of the nature of knowledge, and specifically of the relation between sensation and intellection, the passivity of knowledge is stressed to a very high degree. Together with this is found an extolling of sense experience, so much so that the common saying, "nothing exists in the intellect which was not first in the senses," is interpreted woodenly to mean that there is only a quantitative, not a qualitative, difference between sense and intellect.

In the textbooks the handling of substance reveals considerable confusion and oversimplification. The understanding of substance is drawn not from experience but from the etymology of the word. As a result, substance is understood as merely a nonaccident and as a postulated, shadowy underpinning for accidents.

The conclusion of the dissertation is that Locke gained his philosophical training not from the prominent representatives of scholasticism but from inferior manuals possessing more of pedagogical than intellectual continuity.

with the scholastic tradition. Further, it is clear that Locke's thought is quite indebted to the method and the materials of the textbooks which he studied and taught. As a result, Locke's own works are seen to be notably influenced by his Oxford philosophical training.

Microfilm \$4.00; Xerox \$13.95. 309 pages.

HUMAN OPERATIONS AND THEIR FINALITIES IN ST. THOMAS AQUINAS

(L. C. Card No. Mic 60-342)

Sister Jane Koenen, S.S.J., Ph.D.
St. Louis University, 1959

It is a generally accepted interpretation of St. Thomas that man engages in a multitude of operations which are directed to diverse objects as to their ends. On the other hand, it is agreed that for St. Thomas man in his operations seeks one ultimate end. Each power in operating seeks its proper end; man in operating has one end. Some reconciliation of these two seemingly disparate finalities in human operations becomes necessary.

Among the chief sources of St. Thomas' doctrine on man are Aristotle and John Damascene. Aristotle has found that human activities can be explained best by reducing them to a determinate number of principles or "parts" of the soul. These parts are to be distinguished by object. Aristotle enumerates as powers of man the nutritive and generative power, five external senses, imagination, reason, appetite. Ambiguities remain in Aristotle's descriptions and divisions. Also, he does not formally examine the notion of object. Damascene gives an outline of human powers, but by far his most important contributions are his analysis of rational appetite, often cited by Aquinas, as well as his stress on the motive power and two distinct sense appetites.

In order to differentiate operations, habits, and powers St. Thomas uses the notion of *ratio obiecti*, an element in his doctrine little studied by investigators. For St. Thomas *ratio obiecti* refers to a foundation in things whereby they are referred to the soul. There is a *habitus* or relation existing between things and the soul, and that which grounds this relation is the formal object. The formal object is grasped in operation, and as objects differ, so are distinct powers posited. In addition to distinguishing powers by differing objects, St. Thomas orders powers according to the universality of their objects. The recognition of distinct objects and their subsequent ordering is a difficult task and it should be recognized that certainty is not always achieved.

Two main approaches to the unity of human operations are possible. One takes human operations in themselves, prescind from the nature of man as caused; the other concentrates precisely on this factor of finitude. There is an operational unity in man which results from a higher power directing and using a lower, and, conversely, from the activity of the lower power having as its end the activity of a higher. All man's powers serve the activity of the intellectual potencies. The nutritive operations make possible those of sense, and these in turn are instrumental in intellectual activity. The intellectual powers exercise some control over the sense cognitive powers and through

control of their object can control the appetitive powers. When man is considered in the additional dimension of being caused, he, like any limited being, is found to have one ultimate purpose--the imitation of the perfection of God. However, man imitates God in a special way through knowing and loving Him, and participating in the governance of lower beings. Thus the unity in which all man's powers are directed to his intellectual potencies is subsumed under the higher unity which results from man's direction to his ultimate end.

Microfilm \$2.65; Xerox \$9.25. 202 pages.

TOWARD A REALISTIC THEORY OF MORAL VALUE: A CONSTRUCTIVE STUDY OF PERRY, VIVAS AND T. V. SMITH.

(L. C. Card No. Mic 60-343)

Reverend Donald William Kraus, Ph.D.
St. Louis University, 1959

This dissertation presents the very divergent theories on moral value of three popular, contemporary scholars. It offers a comparison and critique of these three theories, and then attempts to construct a theory growing out of these findings.

The first theory is that of the late Professor Ralph Barton Perry. His theory interprets value as a function of the relation between any object and an interested subject. By describing morality as an interest, he remains consistent with his fundamental identification of values with interests. Morality, according to Perry, is the harmonizing of interests on both the personal and the social levels.

According to Professor Eliseo Vivas, the second moral theorist selected for study, values are objective, absolute and hierarchized. We do not create them; we only discover them. We do this through intuition, a mental perception not unlike our apprehension of any other character of the objective world. This intuition is not infallible, but it is corrigible. Morality consists in conforming the scale of our own espoused values to the absolute hierarchy of values.

Finally, the ethical theory of Professor Thomas Vernor Smith is given consideration. Smith has a propensity toward skepticism, which he strives to offset by avoiding abstruse issues. He finds that most value theories contain more than a grain of truth, and asserts that most of their opposition consists in their insistence that they contain the whole of truth, in their exclusion of other theories. By compounding them, he thinks that a comprehensive theory can be approached. He insists, however, that values are extremely personal and so each person should contain the higher values within himself and compromise the lower in the interest of peace.

These three theories are then compared, criticized and evaluated. In general, the relational theory shows promise of being able to assimilate a great variety of ethical data. But, as weakened and distorted by Perry's psychologizing, it fails to achieve the delicate balance of a realistic position. For this reason, different interpreters have understood Perry subjectively and objectively, as well as relationally. Vivas successfully establishes that universal natures and teleology are an essential requirement for realistic values. But his moral values are objective only

by extrinsic denomination. The objectivistic position is of an ambiguity, which renders it inconsistent with itself. In compounding theories, Smith is unable to elude the tag of incoherent eclecticism. His attempt at a democratic ethic, while nobly motivated, is also unsuccessful, because without content for his norms, they wither into subjective relativity.

The value theory proposed by the author is relational, but not relative in the vicious sense. It is stabilized at the subjective pole in human nature, and at the objective pole in the natures of things. Given an ultimate end for man, the things which surround him in this world stand in determinate relations toward him. Moral value, then, expresses the suitability of human acts to the nature and the end of their agent. Microfilm \$2.85; Xerox \$9.90. 218 pages.

THE MORAL JUDGMENT IN CONTEMPORARY ANALYTIC PHILOSOPHY

(L. C. Card No. Mic 60-346)

Reverend Ronald David Lawler, O.F.M. Cap., Ph.D.
St. Louis University, 1959

Analytical ethics provides a serious challenge to all traditional ethical theories. According to analytic ethicists, a careful analysis of moral judgments reveals that they are not descriptive claims of any sort, not reports on what is. Their function is not to describe anything, but to arouse moral attitudes, or to express moral decisions, to command, advise, and the like. Since they are not descriptive statements at all, they cannot be true or false in the ordinary sense of these terms. It is argued that all "objective" moral theories have fallen into the "naturalistic fallacy," which involves an illegitimate deduction of what ought to be from factual reports of what is, or into an unintelligible affirmation of the existence of nonnatural qualities and special intuitions which could not account for the logic of moral language even if they did exist.

The first chapter of the dissertation discusses the nature of analytical ethics or metaethics. It gives a brief account of the development of analytical philosophy in the twentieth century, and of the ethical theories that have been associated with the earlier stages of this analysis.

Chapters two to five outline the metaethical analyses of four leading contemporary analytical ethicists: Charles L. Stevenson, Stephen Toulmin, R. M. Hare, and P. H. Nowell-Smith. Contemporary analysts concede that there is some kind of meaning or intelligible function worthy of philosophical study in evaluations as such; but they agree with emotive ethicists that evaluations as such do not have descriptive meaning. From a study of the uses of ethical language, however, they seek to show what kind of reasons (or good reasons) can be used to support a moral judgment, to justify (not to prove or show the truth of) a moral decision, verdict or attitude. In this way they hope to develop an ethical theory that will satisfy the demands of ethical usage, yet be compatible with a radically empiricist philosophy.

Chapter six first explores some of the presuppositions of analytical philosophy, especially the influence that its empirical assumptions bear on its analysis. It then attempts to show some of the inadequacies of the various

metaethical theories proposed. Principally, it argues that the alleged "good reasons" that are said to be compatible with a non-cognitive interpretation of evaluations ultimately prove to be no good reasons at all. The analytic theory does not avoid the conclusion that ethical commitments are ultimately irrational, based on merely *de facto* decisions or attitudes which can in no way be proved to be the right decisions or attitudes. Hence interpersonal disputes become insoluble, moral indignation becomes unjustifiable, and obligation and moral sanctions must be given intolerable explanations.

The final chapter suggests that not every ethical theory which insists on the truth and interpersonal validity of moral judgments is subject to the same defects that analysts rightly urge against some objective theories. Though no attempt is made to prove the validity of Thomistic ethics, a sketch of its logical pattern is presented, to indicate that it is able to escape both the naturalistic fallacy and the practical inadequacies of intuitionism, and to offer a fuller solution to the problems of moral language.

Microfilm \$3.50; Xerox \$12.40. 272 pages.

C. G. JUNG'S THEORY OF SYMBOLISM AS A CONTRIBUTION TO AESTHETICS

(L. C. Card No. Mic 60-24)

Morris H. Philipson, Ph.D.
Columbia University, 1959

The purpose of the dissertation is to examine the relations between Jung's general psychology and his reflections on art. It is his theory of symbolism which constitutes the connecting link.

In his general psychology, Jung distinguishes symbols from signs on the basis of source and significance. In individual psychology, neurotic manifestations are signs of malfunctions in the natural (biological) system, which serve to give hints of and clues to their psychological origins. The reductive analysis of such symptoms should free the patient for future effective work. On the other hand, symbols have an entirely independent aetiology, reflecting not blockages in the natural system, but archetypes of the collective unconscious, activated by a withdrawal of energy due to a state of conflict between the contents of consciousness and the unconscious, which indicate "lines" for the future healthful development of the patient. Their symbolic character is understood as intuitive perception of a "fact" not yet clearly known and for which there is no better expression; they point to the future possibility or possibilities most appropriate to the particular patient, rather than referring to a condition determined in the patient's past. The symbol functions in a balancing or compensatory way to the conscious conflict, such that the resolution is achieved neither by the victory of conscious nor unconscious forces alone, but by the transcending and synthesizing "image" which establishes the "middle way" between the two.

Jung sees the nature of art as analogous to the signal and symbolic functions in individual psychology. He distinguishes between two modes of art: Psychological and Visionary. The former he considers comparable to neurotic signs insofar as it can be understood completely in the terms of present psychological knowledge; whereas,

the latter "outstrips" present psychological theory both by its subject matter and methods.

Jung is particularly concerned with defending the sphere of Visionary art against what he considers the destructive analysis of Freudian aesthetics. It is the work of art itself which must be taken seriously, he argues, and that means it should not be "interpreted" by reduction to the artist's (supposed) psychology; rather, it must be examined to discover what it has to say "in itself." What this turns out to be is some reference to an archetype of the collective unconscious rather than anything essentially "personal" to the particular artist who created it.

Jung's position is that this is not a reductive analysis of the sort he finds in Freud's theory of art, since the nature of the archetypes is not "better known." But this appears more as a rationalization than a statement of policy, since Jung certainly writes as if the archetypes are "better known," i.e., more readily comprehensible than any work of art in the Visionary mode, and as if by reference to them what an art-work says "in itself" is made more amenable to rational comprehension.

It is the conclusion of the dissertation that Jung's position, interpreted most broadly, is a defense of the function of criticism for works of art independent of psychologizing, since he argues that (Visionary) art must be protected against being "explained away" by Freudian critics; in other words, any effort to make the art-work significant to the audience by means of conscious interpretation in connection with other elements of "meaning" is valid and valuable (by analogy with the effort of the therapist and patient as they interpret a private symbol in psychoanalysis). But, interpreted more narrowly, it would appear that Jung's implication is only that Jungian analysts should replace the Freudian ones and their criticism is the only "true" interpretation of Visionary or symbolic art, since it is only they who understand what a symbol truly is--relative to their theory of universal archetypes.

Microfilm \$2.50; Xerox \$8.40. 185 pages.

THE METHOD OF THE SCIENCES ACCORDING TO CHARLES SANDERS PEIRCE

(L. C. Card No. Mic 60-353)

Reverend Francis Eagan Reilly, S.J., Ph.D.
St. Louis University, 1959

According to Charles Sanders Peirce (1839-1914) science is the activity of scientific men. What makes a man a scientist is his eagerness to know. The pure love of truth stimulates a man to undertake an inquiry into the ways of nature, and the same motive will direct his choice of a method of inquiry. The scientific inquirer will inevitably turn to the method of hypothesis and verification.

Intelligent experience of nature must precede the formation of the hypothesis, which attempts to provide a conjectured explanation of the observed phenomena. The explanatory hypothesis, formed by a process of "abduction," must be capable of some sort of verification. It need not be directly verifiable, but it at least must lead to the prediction of consequents which are testable by direct obser-

vation. Such prediction is accomplished by deduction in keeping with Peirce's understanding of pragmatism. For Peirce pragmatism is a method of understanding a concept by considering the observable general consequences resulting from the truth of the concept.

Abduction, although it is the only way in which new ideas enter science, depends for its validity on successfully surviving the verification process. After observable consequents have been deduced from the hypothesis, the inquirer must see whether the consequents turn out as predicted. From the results of the tests, the inquirer passes judgment on the worth of the hypothesis, and adjusts it, or accepts it, or rejects it, as necessary.

Even though the hypothesis is accepted, with or without modification, it is still far from certain. Repeated and varied tests can strengthen it, but at best it is still a fallible explanation. Fallibility limits all knowledge, both because of the nature of the scientific method, and because of the evolving character of the universe which the scientist studies.

The universe is growing in variety, and variety arises through unpredictable chance developments, which make the value of our knowledge quite temporary. However, the chance varieties, which manage to survive, form regular patterns, open to scientific examination. The universe, then, while it moves away from the formulations of it which scientists have devised, is nevertheless becoming more intelligible and more deserving of scientific investigation.

While there is no hope of achieving any completely lasting scientific formulation of the cosmos, the community of scientists must continue to track down the ways of nature by hypothesis and verification, relying on the affinity of the human mind for the universe with which it is continuous.

The method of hypothesis and verification, for Peirce, is the only worthwhile method of knowing, and must be extended from the physical sciences to metaphysics. Use of this method will turn metaphysics away from the nominalism which has plagued it for centuries, to a more satisfactory understanding of the general truths of the cosmos, which really represent what real beings are in themselves.

In his eagerness to eliminate unsuitable methods of inquiry, however, Peirce has closed off all ways of knowing except that of hypothesis and verification, and has apparently disregarded his own law of keeping the way of inquiry open.

Microfilm \$4.10; Xerox \$14.40. 317 pages.

THE CENTER IS MAN: A CORRELATIVE STUDY OF LATE NINETEENTH-CENTURY AMERICAN ART AND PHILOSOPHY.

(L. C. Card No. Mic 58-7237)

Lawrence Eugene Scanlon, Ph.D.
Syracuse University, 1958

The purpose of the present work is to investigate the possibilities of cultural unity in a given time and place, late nineteenth-century America. The initial chapter is devoted to the setting forth of a number of key ideas as they are manifested in the period in various cultural forms. The ideas that emerge from this discussion are the following: rejection of the Absolute and adoption in its stead of

the concept of flexibility; complete orientation toward man and his world; preoccupation with the criterion of the practical or functional; exultation over man's role as creator; and utilization of the concept of organism as a major organizing principle for the interpretation of human experience. These five ideas, loosely grouped together under the designation 'anthropocentrism,' guide the examination in ensuing chapters of such important artists and thinkers as Thomas Eakins, the painter, the psychologist-philosopher William James, his novelist brother Henry James, and Louis Sullivan, the architect. Critical analyses of important works by each man are then aimed at demonstrating to what extent and in what ways the same key ideas are expressed by men of differing temperaments and in different cultural disciplines.

The chapter on Eakins is mainly concerned with that painter's iconography and style. Among the paintings critically examined are Max Schmitt in a Single Scull, The Gross Clinic, The Dean's Roll Call, and Between Rounds. A portion of this chapter is also devoted to a discussion of Eakins' contemporaries in the realistic movement, William M. Harnett and Winslow Homer. In the following chapter the writings of William James are brought under scrutiny, especially The Principles of Psychology and Pragmatism.

Some attention is also given to another nineteenth-century pragmatist, Charles Sanders Peirce. Next, with regard to the younger James brother, the critical writings on the craft of fiction and the notebooks are studied in their relationship to anthropocentrism. The major portion of this chapter is an intensive analysis of The Wings of the Dove, a masterpiece of Henry James's later method. The final analytic chapter, on Sullivan, is divided fairly equally between this architect's writings, chiefly Kindergarten Chats and The Autobiography of an Idea, and some of his important buildings. There is also reference in this section to his colleague and forerunner, Henry Hobson Richardson.

On the basis of the evidence presented in the preceding chapters, several proposals are advanced in the "Conclusion" in an effort to account for the appearance of the same ideas in the work of all the individuals discussed. The possibility of mutual influences or a major source of influence is discussed and then discounted. The only conclusion that under the circumstances seems valid is a purely speculative one: the operation of a time-spirit, a Zeitgeist, a concept that is now set forth. A brief discussion of anthropocentrism as the time-spirit of the late nineteenth century in America concludes the dissertation.

Microfilm \$3.25; Xerox \$11.20. 250 pages.

PHYSICS

PHYSICS, GENERAL

FLASH PHOTOLYSIS OF RHODOPSIN IN SOLUTION

(L. C. Card No. Mic 58-7204)

Ralph Grant Adams, Ph.D.
Syracuse University, 1958

The primary event responsible for vision is photochemical; this statement is well founded on the evidence of many experiments beginning with those of Hecht (1919-20) on the photochemical nature of the withdrawal reaction of the clam Mya arenaria. The agreement of absorption curves of the photosensitive pigment rhodopsin, found in the eye, with the action spectrum of the frog eye and with the sensitivity curve for the human eye in further evidence.

The end result of illumination of the eye is a nerve impulse sent to the brain but the potential which generates this impulse must be brought about by either the photochemical process or some processes subsequent to it. Since no evidence exists to elucidate these intermediate processes, it seems essential to examine the bleaching of the visual pigment, rhodopsin, for transient products.

A method of synchronously exciting all the molecules in a sample of rhodopsin is suggested by Porter (1950). This method has been adapted to the purpose outlined here by Linschitz et al (1957) to allow reconstruction of spectra of transient photoproducts as well as the analysis of the kinetics of the decay of rhodopsin following flash excitation.

The data consist of oscillograms at various wavelengths and sweep speeds, with controls to allow quantitative computations of density changes both during and follow-

ing flash illumination. Depending upon the sign, these changes in density may be added to or subtracted from the original absorption spectrum of the rhodopsin sample to produce a spectrum at any time following flash excitation. If these density changes are followed as a function of time at a single wavelength and temperature, since density is proportional to concentration, one may find the order of the reaction by means of the kinetic isotherm equation.

The data indicate that the initial photoproduct consists of a population of molecules with different properties, since the subsequent delay occurs in a series of monomolecular processes with increasing time constants. Based upon the known facts about the isomeric nature of retinene (Hubbard & Wald, 1952) this suggests a population of retinene-isomer-protein complexes hydrolyzing at different rates. This is in agreement with the scheme proposed by Hubbard & Kropf (1958) wherein the first quantum striking a rhodopsin molecule produces an all-trans retinene-opsin complex the retinene of which may be re-isomerized by a second quantum hit.

It was felt that this hypothesis might be supported if one could show by removing the retinene molecule subsequent to the first quantum hit, but prior to the second, that no isomeric mixture existed. Solution of rhodopsin containing M/70 hydroxylamine, which can remove loosely bound retinene from opsin, were bleached serially and absorption spectra obtained on the Cary recording spectrophotometer following each exposure to light. When low intensity light and long durations were employed, a series of spectra showing a clean isosbestic point and no shift in the rhodopsin maximum absorption peak were obtained. If the light intensity was increased 10^2 times and the duration

reduced by the same factor, no isosbestic point was obtained and the maximum absorption peak of rhodopsin shifted to 490 m μ indicating isorhodopsin was present and implied a production of an isomer mixture.

Microfilm \$2.50; Xerox \$3.00. 59 pages.

THEORY OF SOLID He³

(L. C. Card No. Mic 59-6937)

Newton Bernardes, Ph.D.
Washington University, 1959

Chairman: Henry Primakoff

A theoretical analysis of the properties of solid He³ is presented on the basis of: 1) a gas-phase 12-6 Lennard-Jones interatomic potential modified at small interatomic distances; 2) a Heitler-London type variational wave function, for all the atoms in the solid, constructed from a properly antisymmetrized product of single particle orbitals localized on various lattice points; 3) a Dirac vector model to describe the symmetry energy, with an exchange integral deduced from 1) and 2); 4) a spin-wave approximation at "low" temperatures, and a Kramers-Opechowski approximation at "high" temperatures, for calculation of the "spin" partition function; and 5) a Debye-phonon model for the description of the vibrationally excited states of the solid. On this basis several properties: cohesive energy, entropy, specific heat, coefficient of thermal expansion, magnetic susceptibility, etc., of solid He³ are calculated at pressures of the order of 30 atmospheres and temperatures below 1° K. In particular the melting curve is predicted to have a minimum at 0.35° K, and a maximum near 0.05° K.

Microfilm \$2.50; Xerox \$4.20. 80 pages.

THE DYNAMICS OF EXCITED ELECTRONS IN CRYSTALLINE PHOTOCONDUCTIVE PHOSPHORS

(L. C. Card No. Mic 60-502)

Richard J. Herman, Ph.D.
New York University, 1957

Adviser: Hartmut P. Kallmann

An analysis is given of a number of important phenomena occurring in crystalline phosphors, in which excitation by radiation leads to production of free electrons, which do not recombine immediately, but remain in the conductivity band or are trapped in isolated single levels located in the forbidden band. Two basic assumptions are made: It is assumed that the equilibrium relationship between the electrons in the conduction band and those in the traps (a Fermi distribution in the energy depth of the traps) also holds approximately for a slowly varying steady state in such phenomena as the decay of luminescence and conductivity. This means assuming that retrapping of electrons is the dominant process. Recombination is treated as a small perturbation, in contrast to Randall and Wilkins' theory, which treats recombination as dominant over retrapping. In addition it is assumed that, in most of the calculations presented, the trap distribution is continuous (and

approximately uniform) over a limited energy range.

These simplifying assumptions make it possible to solve the basic system of differential equations of the excitation and decay process, which are non-linear and too complicated to be solved exactly. This enables us to account for the most important aspects of the behavior of phosphors:

(1) Decay curves for conductivity and light emission are calculated. In general, for light emission the result is an initial exponential decay while equilibrium is being established, then a $1/t$ decay, then a long region of hyperbolic decay, and eventually, after very long times, a $1/t^2$ decay. This is in excellent agreement with the qualitative features of experimental decay measurements. While Randall and Wilkins also predict a hyperbolic decay, they cannot account for the other types of decay that occur in various parts of the curve. Furthermore, it is not necessary to assume as deep traps as their theory requires.

Thus a number of difficulties associated with the assumption of very deep traps are avoided. In addition, it is possible to predict the similarity between light emission and conductivity decay curves, while Randall and Wilkins' theory does not provide any information on conductivity at all.

(2) Rise curves for conductivity and light emission are calculated. The resulting curves are S-shaped, starting at zero with zero slope, in agreement with experiment. These curves contrast sharply with those for electron excitation, discussed below. Here the assumption of equilibrium is more questionable, since deep traps probably do not have time to come to equilibrium during rise curves.

(3) Glow curves for conductivity and light emission are calculated. The glow curves calculated from our assumptions are similar in shape to those of Randall and Wilkins, but the numerical values of the temperature at which the peaks occur are quite different.

(4) The rise and decay of infra-red stimulated light emission are calculated. By assuming that infra-red affects the positive charges rather than the trapped electrons, a roughly quantitative theory is developed which is free from several serious qualitative difficulties which occur in the older theories. Under very strong infra-red irradiation, eventually a range is reached where the recombination becomes the dominant process, as Randall and Wilkins assume for unstimulated decay. Calculations are carried out for this case, assuming however, that the initial distribution is the Fermi distribution we find for equilibrium, and not the uniform distribution Randall and Wilkins assume, and that the traps lie between finite upper and lower limits. This theory provides an explanation of the hyperbolic decay of stimulated light emission.

In addition, to explain the experimental phenomena of electron excitation, a theoretical model for the excitation of localized channels by high-energy particles is developed. The resulting rise curves, in contrast to those for uniform excitation, begin at a finite light emission value and have a finite initial slope, in agreement with experiment. Excitation, decay, and subsequent reexcitation are studied. In contrast to uniform excitation, a "hysteresis loop" is predicted, which again is in conformity with experiment. This treatment is quite general and completely independent of the validity of the theory of uniform excitation, but the decay of each channel once it has been excited must be determined by some physical model, e. g. the assumption made above, if the channel excitation model is to yield any specific information.

Microfilm \$2.50; Xerox \$8.00. 175 pages.

THE STATISTICAL MECHANICS OF IRREVERSIBLE PROCESSES

(L. C. Card No. Mic 60-408)

Kyozi Kawasaki, Ph.D.
Duke University, 1959

Supervisor: Michael J. Buckingham

An attempt is made to construct a general statistical mechanics which incorporates non-equilibrium as well as equilibrium problems. The starting point is a rather elementary concept of the number of paths in phase space in classical statistical mechanics. For microcanonical ensemble, a density matrix is found which describes a quantum mechanical analogue of an ensemble consisting of the paths in phase space which pass through gates set up at different instants of time. Using this density matrix, one can define a path distribution which gives the probability that a variable takes certain values at certain instants of time. This can be regarded as a natural generalization of Boltzmann's principle connecting entropy and number of microscopic states. A stochastic model such as Onsager and Machlup's can be deduced from our path distribution by a sort of averaging procedure which effectively destroys phase relations between the states at different times except those between every two consecutive times. However, the essential advantage of our method is that one can dispense with such an artificial procedure, and once the initial density matrix is given, no new assumption is necessary in principle, except that of Onsager, namely, that a macroscopic dissipation process obeys the same law as the regression of fluctuations in thermal equilibrium. Our method is applied to the problem of the response of a system of usual type to external disturbances, and expressions for dissipation coefficients are given in terms of correlation functions of molecular variables, which agree with the known results. An application to systems with anomalous response characteristics is suggested.

A new method of obtaining entropy is proposed based on the assumed equivalence of the total "macroscopic information" at a given instant of time and the complete subsequent behavior of the system, the latter being represented by the path distribution at all subsequent times. The non-decreasing nature of entropy is naturally understood as a loss of information as time goes on. For systems described by Markoff stochastic processes our entropy reduces to the usual one.

Finally, the method is extended to the canonical ensemble, in which, in addition, only average values of a variable can be specified. As far as the average behavior is concerned, the results are not changed except that the correlation functions must be suitably re-defined.

Microfilm \$2.50; Xerox \$3.80. 68 pages.

LIGHT SCATTERING FROM LIQUID HELIUM

(L. C. Card No. Mic 60-469)

Eugene J. M. Lynch, Ph.D.
Duke University, 1959

Supervisor: Michael J. Buckingham

Light scattering from ordinary fluids can be explained on the basis of Rayleigh scattering from density fluctu-

ations in small volume element within the fluid. The magnitude of the scattering is proportional to X , the isothermal compressibility. The strange properties of liquid helium near the lambda point can be qualitatively explained by analogy with those of an ideal Bose-Einstein gas. Several papers have been written which point out that the compressibility of such a gas becomes infinite at the condensation temperature, and hence, one might expect liquid helium to scatter light very strongly there. Such a phenomenon would be analogous to critical opalescence at the critical point in an ordinary liquid.

Two qualitative experiments, and one quantitative experiment have been performed in an attempt to observe this phenomenon. The investigators in the latter experiment stated that their observations agreed with the classical formula within 20%, even when the temperature was within three millidegrees of the lambda temperature.

Recently, experimental data on the behavior of helium in the neighborhood of the lambda point have become available, which are much more refined than the previously accepted data, and which have altered the conception of the nature of this transition. These data only differ from the previous data within a few millidegrees of the lambda temperature; however, they show that extrapolations from the older data to the lambda point were invalid.

A new investigation of the density fluctuations and light scattering in liquid helium in the immediate neighborhood of the lambda point has been made, based on the new thermodynamic data. The new data suggest that the pressure-volume relation in this region is

$$\frac{v-v_\lambda}{v_\lambda} = K \left(\frac{p-p_\lambda}{\bar{p}} \right) \ln \left| \frac{p-p_\lambda}{\bar{p}} \right| \quad (1)$$

where K and \bar{p} are constants which can be evaluated from the experimental results. Using this relation, we find that the density fluctuations are given by

$$\overline{U^2} = \frac{1}{8} K^2 G \left(\frac{v_\lambda}{v} \right)^2 \left| \ln \left[\left(\frac{p-p_\lambda}{\bar{p}} \right)^2 + G \right] + 2 \right| \quad (2)$$

where $G = \frac{4kT}{K\bar{p}v_\lambda}$. Thus, the fluctuations increase logarithmically as the lambda point is approached, until this increase is cut off when $(p-p_\lambda)^2$ becomes of the order of $G\bar{p}^2$.

We find that this cut-off occurs for temperature differences from the lambda temperature of about 10^{-4} °K, and that the maximum value of the relative scattering of vertically polarized light, which occurs at the lambda temperature, is $4 \times 10^{-8} \text{ cm}^{-1}$, or approximately 50% greater than the value obtained by applying the Rayleigh formula at the lambda point. However, the increase in scattering over that far from the lambda point is only 3%. It is not surprising that the enhancement has not been detected in the previous experiments, since the minimum increase in the scattering which could have been detected in the one quantitative experiment was 20%. An increase of an order of magnitude in the sensitivity is required to detect the enhancement experimentally.

It is also pointed out that an enhancement of the scattering occurs at small angles, which is caused by correlations between density fluctuations in different volume elements. The intensity of this scattering will be a function only of $w = \lambda^{-1} \sin \frac{\theta}{2}$, where λ is the wavelength of the light,

and θ is the angle between the incident and scattered beams. A measurement of the small angle scattering would determine the Fourier coefficients of the mean correlated density fluctuations. A measurement of the scattering of the mercury blue line ($\lambda = 4358 \text{ \AA}$) at $\theta = 1^\circ$ would be a measure of the correlations over a distance of the order of 20 \AA . Microfilm \$2.50; Xerox \$3.00. 30 pages.

THE SOLUTION OF A REDUCED BETHE-SALPETER EQUATION

(L. C. Card No. Mic 60-349)

Edward Michael MacKinnon, S.J., Ph.D.
St. Louis University, 1959

The Bethe-Salpeter equation, which was developed in 1951 from Feynman's theory of quantum electro-dynamics, was the first covariant two-body relativistic wave equation. Through perturbation methods this equation has been used quite successfully to obtain higher order corrections to the Dirac energy values. However, it has not been shown, either by perturbation methods or by a direct solution, that the Bethe-Salpeter equation reproduces the solution of the Dirac equation to a sufficient degree of accuracy to yield the fine-structure splitting. The application of the Bethe-Salpeter equation to similar, but simplified, problems by Wick, Cutkowski, Scarf, and Umezawa suggested that this equation will not yield the fine-structure splitting. The central problem of this dissertation is to determine whether or not the Bethe-Salpeter equation does reproduce the Dirac results for the hydrogenic atom.

To solve this problem it was sufficient to introduce approximations consistent with the degree of accuracy required to reproduce the fine-structure splitting, i. e., to an accuracy of order α^2 (where α is the fine structure constant) in the equation. To this degree of accuracy the Bethe-Salpeter equation may be reduced to an 'equivalent' one-body equation by using Salpeter's non-covariant three-dimensional form of the original equation.

A two step process was used in the solution. First, a simplified equation, obtained by dropping higher order correction terms, was solved exactly in configuration space and transformed into a momentum space solution. With these simplified functions as a first order solution, the Fock-Lévy method of solution was applied to the four simultaneous integral equations which represent the reduced Bethe-Salpeter equation in momentum space. The only admissible solution found was one which required fine-structure splitting. To determine the exact value of this splitting a perturbation calculation was used to supplement the formal solution. The result obtained was that the Bethe-Salpeter equation does reproduce the Dirac eigenvalues, i. e., the fine-structure splitting, but that the corresponding eigenfunctions differ in terms of order α^2 .

Microfilm \$2.50; Xerox \$7.80. 169 pages.

NUCLEAR MAGNETIC RESONANCE IN SOLID HYDROGEN AT HIGH PRESSURE

(L. C. Card No. Mic 60-470)

William D. McCormick, Ph.D.
Duke University, 1959

Supervisor: William M. Fairbank

Because it should be the simplest of all molecular crystals solid hydrogen has always been of great interest. During recent years nuclear magnetic resonance has been used by several observers as a tool to investigate the interesting physical properties of this substance. It was the purpose of this work to carry these investigations into the realm of high pressures. The temperatures of interest were those easily obtainable in boiling liquid helium, that is, 4.2°K to 1.4°K. The experimental problem, therefore, was to develop apparatus capable of subjecting solidified hydrogen to pressures of about 5,000 atmospheres at liquid helium temperatures while simultaneously measuring the magnetic resonance absorption. Since nuclear resonance requires the presence of a very homogeneous magnetic field, steel, being ferromagnetic, could not be used for the construction of the high pressure chamber.

These problems were solved by using austenitic stainless steel tubes to carry the compressive force by a beryllium copper high pressure chamber. Both materials are nonmagnetic, the thermal conductivity of the stainless steel is very small and beryllium copper is probably the strongest non-ferrous alloy known. A gas tight high pressure seal of the "Amagat" type was used to bring the radio frequency signal lead into the high pressure cylinder. The sealing cone was "pipestone" and a thermosetting epoxy resin was used extensively in the construction. The equipment has operated successfully at pressures in excess of 5,000 atmospheres.

In solid hydrogen at atmospheric pressure there is a thermodynamic transition of the so-called λ type at 1.6°K. This manifests itself by a splitting of the nuclear resonance line. It has been found that the temperature at which this transition occurs rises rapidly as a function of increasing pressure. The width of the resonance line above the transition temperature and the rate of conversion from ortho-hydrogen to parahydrogen have also been found to vary as a function of the pressure. In both cases, the experimental results fit in very well with the present theories of these phenomena. A brief investigation of the HD molecule was also carried out to search for a transition of the type discussed by F. London. At pressures up to 8,000 atmospheres where the high pressure cylinder burst, the transition had not yet occurred.

There are many other solidified gases with interesting features at low temperatures such as rotational transitions; it is hoped that in the future the techniques developed in this work will be used to study them.

Microfilm \$2.50; Xerox \$3.00. 49 pages.

THE DISTRIBUTION OF SEISMIC WAVE ENERGY AT A FREE SURFACE

(L. C. Card No. Mic 59-6795)

John Arthur Ryan, Ph.D.
The Pennsylvania State University, 1959

This paper treats the distribution of seismic wave energy at a free surface in the presence of interference. To investigate this, both the time and distance derivatives of particle displacement are considered. These quantities are a measure of the kinetic and the strain energy associated with the waves. This approach is in contrast to that used in most investigations where only one of these derivatives is measured.

Interference generally occurs if two or more waves are present. Various combinations of waves are considered theoretically, on the basis of measurements at a free surface. This treatment shows that the presence of interference generally causes the amplitude of motion to be dependent upon the position on the surface at which the measurements are made. Interference also affects the distribution of energy into kinetic and strain, and causes the magnitude of each to be dependent upon position. It is not sufficient to determine only the kinetic (or strain) energy, and to assume that this energy is proportional to the total energy. Instead, it is necessary first to identify and to define the nature of the wave field. This can only be done, in general, by measurement of both the time and distance derivatives.

The interference types chosen are representative of those that may exist close to a source of seismic energy, before much separation of the waves has occurred. The results show that for two incident waves the amplitudes of the particle velocity and strain vary sinusoidally along the surface. This variation is similar to that observed by Andrews (1957) and Watson (1958) in their work on the attenuation of seismic wave energy.

An experimental study is made on a thin rod of finite length, driven sinusoidally at one end, and free at the other. Standing waves, a simple type of interference, are generated. Gages are used to measure both the displacement and the strain. The results are predictable from the theory, provided that the particle velocity rather than the pressure is specified at the driven end. The measurements show the interference pattern quite clearly.

Microfilm \$2.50; Xerox \$5.00. 97 pages.

THE STRUCTURE OF PARTICLES IN LINEARIZED GRAVITATIONAL THEORY

(L. C. Card No. Mic 58-7235)

Rainer Kurt Sachs, Ph.D.
Syracuse University, 1958

We have examined the invariant character of restrictions imposed on singularities or other sources of the gravitational fields in the EIH theory of motion in General Relativity. We have succeeded in providing a complete classification of sources that can occur in the linearized theory only, in terms of properties that are invariant under Lorentz and "gauge" transformations (the latter designa-

tion refers to linearized curvilinear coordinate transformations). Except for several explicitly known solutions, all solutions can be derived from a "supermetric" corresponding to the Hertz potential of electrodynamics. One method of classification is in terms of gauge-invariant integrals over spatial closed surfaces completely surrounding the particles. The motion of each source is determined by its own intrinsic angular momentum and dipole moment. The results do not depend on any particular form of the stress-energy tensor of the sources.

Microfilm \$2.50; Xerox \$3.00. 24 pages.

THE INTERACTION BETWEEN A STRONG SHOCK WAVE AND AN INHOMOGENEOUS MAGNETIC FIELD

(L. C. Card No. Mic 59-2799)

Murray Scheibe, Ph.D.
University of Maryland, 1959

Supervisor: Professor Johannes M. Burgers

The interaction between the flow of the high speed, ionized gas behind a strong shock wave and an inhomogeneous magnetic field is investigated experimentally. Field strengths of up to 65000 gauss and shock waves of up to Mach 27 are used.

The non-uniformity of the magnetic field is assumed to provide the mechanism through which the induced currents form closed circuits in the gas.

The flow pattern resulting from the interaction is found to agree qualitatively with a one dimensional treatment of the problem. Secondary shocks are formed in the field and their position seems to depend on the interaction parameters in a way expected from the one dimensional theory.

Since the interaction is non-isentropic the transmitted shock wave is decreased in strength. However, the decrease is less than that predicted by the theory, and is also temporary. The transmitted shock readjusts rapidly to approximately its original value. Both these facts are attributed to three dimensional effects.

The expansion wave, which is necessary to match the pressure and velocity of the gas which has passed through the field region to that of the gas behind the transmitted shock which has not, is also observed experimentally.

Microfilm \$2.50; Xerox \$5.60. 114 pages.

NUCLEAR MAGNETIC RELAXATION

(L. C. Card No. Mic 59-6943)

Arden Sher, Ph.D.
Washington University, 1959

Chairman: R. E. Norberg

The Thesis has three major parts. The first is a theoretical work in which the density matrix formalism is used to derive the Boltzman "gain-loss" equation from the Schrodinger equation. This Boltzman equation is then solved and the solutions are applied to magnetic resonance situations.

The second part of the thesis consists of the analysis and experimental verification of a novel field sweep modification of the Carr - Purcell experiment.

Finally the proton T_1 and T_2 are measured and analyzed in Na - NH_3 solutions as a function of Na concentration and temperature.

Microfilm \$2.50; Xerox \$6.20. 130 pages.

PROPERTIES OF MATTER AT VERY LOW TEMPERATURES

(L. C. Card No. Mic 59-6644)

Tse-pei Tseng, Ph.D.

The Ohio State University, 1954

Experimental investigations have been carried out on (i) the thermal conductivities of copper and lead at liquid helium temperatures and (ii) the vapor pressures of solution of He^3 in He^4 .

Part i. — In the measurements of the thermal conductivity, the standard method of steady heat flow was used. The specimens employed were polycrystalline. Copper wire of commercial grade purity manufactured by The General Electric Company was studied, and the lead samples consisted of cold-worked strips made from rods of spectrographical purity supplied by Johnson, Matthey & Company, London. Carbon radio resistors served as thermometers; the electrical heater was manganin wire. The complete apparatus was immersed in a bath of liquid helium to maintain the necessary temperatures of operation.

As a preliminary part of the experiments, the thermal characteristics of the carbon resistance thermometers ($\frac{1}{2}$ watt, nominal 10-ohms supplied by the Ohmite Manufacturing Company) were investigated under several different arrangements in which the resistors were either in direct or indirect contact with the liquid helium bath. Resistance measurements were made potentiometrically using different measuring powers up to 100 micro-watts. At each temperature of observation, therefore, the resistance, R_0 , at zero measuring power could be found by extrapolation, and the thermal transfer coefficient between the resistor and its surroundings also could be computed.

Plots of the logarithm of R_0 versus $1/T$ exhibited an almost linear relationship in the range 1.2° to 4.2° K for all types of arrangements employed, with slight deviations at the lower temperatures. The value of the thermal transfer coefficient was found to be of the order 10^{-3} watt/degree at 4.2° K and to decrease to about 10^{-4} at 1.2° K, the variation with the temperature being approximately linear.

The experimental procedures for measuring the thermal conductivity of both copper and lead were similar. Calibration curves for the carbon resistance thermometers were first obtained using different measuring powers. The absolute temperature at each calibration point was determined from the vapor pressure of the liquid helium bath.

For the measurements on lead in the normal state the necessary (longitudinal) magnetic field was supplied by an air and water cooled solenoid, capable of a maximum field of 940 gauss.

The results for copper indicate that the value of its thermal conductivity is closer to that obtained by Mendels-

sohn and Rosenberg¹ and a great deal higher than that of Allen and Mendoza.²

It is customary to describe the thermal conductivity, when it is predominantly electronic as in copper, by the relation

$$1/K_e = \alpha T^2 + \beta/T \quad (1)$$

where the first term shows the effect of scattering of the electron waves by lattice vibrations and β that of scattering by impurities and lattice imperfections. Our results show that $\beta = 0.52$ watt/cm.deg. and $\alpha \approx 0$ in the temperature range 1.4° K to 4.2° K.

The results for lead indicate that its thermal conductivity in superconducting state, K_s , varies with $T^{3.8}$ in the lower temperature range 1.4° K to 3° K. The results for lead in the normal state indicate that the curve plotting K_n versus T , if extrapolated to 0° K, fails to intercept the axes at the origin, suggesting that the specimen might not have been completely in the normal state in the measurements taken at the few lowest temperatures. After casting aside these doubtful observations, the values of α , β of equation (1) were estimated to be 2.3×10^{-3} watt/cm.deg.³ and 0.18 watt/cm., respectively, in the temperature range 2.7° K to 4.2° K. The fact that the values of K_n obtained in the present measurements lie well below those of Rademakers³ and of Mendelssohn and Rosenberg,⁴ who used single crystal samples, can be explained as being the result of differences in the physical states of the specimens used.

A plot of the observed variation of the ratio K_s/K_n with T/T_c for lead indicates that impurity scattering still plays a more important role than lattice scattering in determining the thermal conductivity at temperatures below 2.6° K. The impurity scattering presumably included a large part resulting from lattice dislocations in the polycrystalline samples.

Part ii. — Study of solutions of He^3 in liquid He^4 has engaged wide interest because it helps to elucidate problems concerning the pure solvent. Investigations of the superfluidity of the solution were first undertaken by Daunt and co-workers⁵ who found that the rare isotope He^3 did not partake of superfluid flow. A subsequent experiment by Taconis led him to postulate the hypothesis that He^3 has perfect solubility only in the normal component of the helium fluid.

Several theories have been put forward to explain the phenomena of these solutions; among the theories that merit attention were those advanced by de Boer and Gorter⁶ and by Heer and Daunt.⁷ The theory of de Boer and Gorter is based on the Taconis hypothesis; it uses classical statistical mechanics with assumptions for the minimization of the Gibbs function at equilibrium and for the vapor phase being regarded as ideal gas. The resulting expressions for the partial vapor pressures of He^3 and He^4 are amenable to computation. Moreover, by assuming the transition to be one of the second kind, de Boer and Gorter⁶ were led through further thermodynamic reasonings to expressions for the discontinuities in the temperature derivatives of the distribution coefficient and of the partial vapor pressures of the components.

London⁸ has explained the λ -transition in liquid helium as a condensation phenomena characteristic of the degeneracy of a Bose-Einstein gas perturbed by the presence of the molecular forces. The theory of Heer and Daunt extended London's theory to include the He^3 isotope.

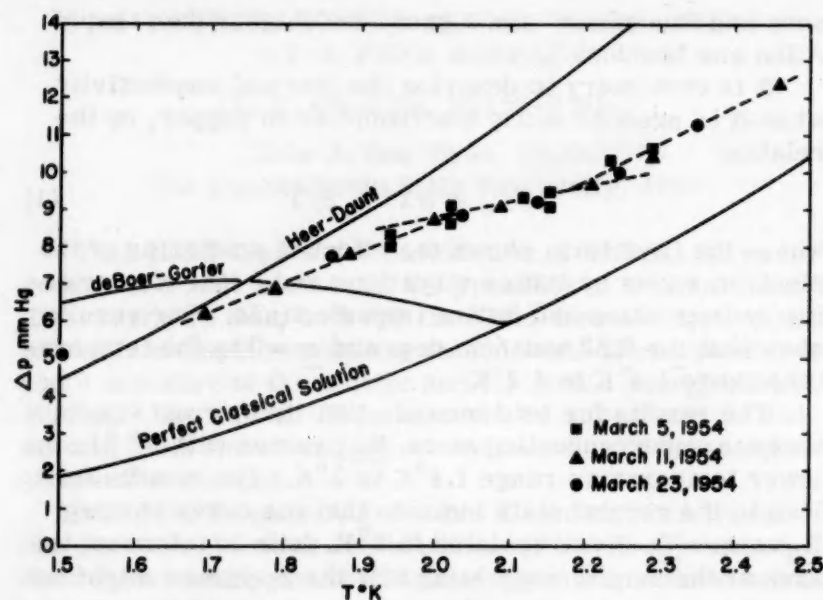


Fig. 1. The excess vapor pressure of 4% solution of He^3 in He^4 .

Smoothed potential wells were assumed for the liquid He^3 and He^4 atoms, which were assumed to be statistically independent. As a first approximation, degeneracy was introduced only in the Bose-Einstein component, the Fermi-Dirac component remaining nondegenerate. It was shown that the Gibbs function could be approximated by the free energy, and (with the vapor phase assumed to be ideal) the usual thermodynamic relations were applied to give expressions for the partial pressures of the components. However, no discontinuity was obtained in the temperature derivative of the distribution coefficient or of the vapor pressures.

To compare both theories, we have carried out experimental evaluations of the vapor pressures as a function of temperature for a 4 per cent solution. This was done because previous measurements of the vapor pressure and of the distribution coefficients of solutions of He^3 in liquid He^4 have yielded discordant results, particularly at temperatures below λ -point of the solution. The measurements were conducted using gas of unrefrigerated 4 per cent concentration of He^3 supplied by the Atomic Energy Commission. The experimental arrangement consisted of two copper specimen chambers resting on a common copper base immersed in a bath of liquid helium. Two carbon resistance thermometers, of the kind used in the thermal conductivity measurements, were arranged in horizontal positions in each chamber; there they were supported on mica sheets. The net volume of each chamber was 2.00 cm^3 . Two resistance thermometers, each mounted in a copper tubing fitting a hole threaded in the copper base, were situated near the rim of each chamber. Stainless steel filling tubes with 0.0079 cm. inner diameter were soldered to the top of each chamber. An absolute manometer manufactured by Wallace and Tiernan Products Inc. was converted to measure the differential pressure between the two chambers. The volume of dead space above the solution chamber was estimated to be 3 cm^3 approximately.

In the three experimental runs different amounts of mixture gas were transferred through a Toepler pump and condensed into one chamber, and pure He^4 was condensed in the other chamber. The difference in pressure, Δp , between them was observed at various temperatures.

A plot of the observed excess vapor pressure Δp of the solution over that of the pure He^4 versus the temperature shows two abrupt kinks, one apparently at the λ -point of the pure solvent and the other at the λ -point of the solution, as shown in Fig. 1. Resistances for one carbon resistance thermometer in each chamber were also measured, indicating no obvious irregularity at these transition points. When our observed Δp is added to the known vapor pressure of pure He^4 , the resulting total vapor pressure of the solution was found to be in good agreement with values obtained by interpolation of the results of Sommers.¹⁰ We have included in Fig. 1 value of Δp as computed from the theories of de Boer and Gorter as well as of Heer and Daunt.

The kink in the curve of Δp versus T at 2.17°K can be explained as resulting from the irregularity of the vapor pressure curve of pure He^4 near the λ -point as given by the accepted 1948 temperature scale. Such irregularities have recently been found by Erickson and Roberts¹¹ from susceptibility measurements of paramagnetic salts immersed in liquid He^4 . The angle of kink at the λ -point of the pure He^4 is 5.5 mm. Hg/deg., about 25 per cent higher than that given by the irregularity in the pure He^4 vapor pressure curve. The observed kink at 2.03°K (see Fig. 1) has an angle measuring about 4 mm. Hg/deg., presumably due to an irregularity that occurred also in the solution vapor pressure at its λ -point. If the difference of the measured angles of the two kinks could be explained as the result of the discontinuity cited in the theory of de Boer and Gorter, it would lead to a predicted value for the difference of the specific heat at the λ -point of the solution of value $-0.47 \text{ R cal./mole.deg.}$

Microfilm \$2.50; Xerox \$6.00. 124 pages.

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MOLECULAR DIFFUSION STUDIES IN BINARY GAS SYSTEMS

(L. C. Card No. Mic 59-2802)

Ronald Elliot Walker, Ph.D.
University of Maryland, 1958

Supervisor: Dr. Edward A. Mason, Associate Professor

A new method of measuring binary gas diffusion coefficients has been introduced and critically examined. The basic idea of the technique is to inject at a constant rate a trace gas from a fine tube (simulating a point source) into a jet stream of carrier gas having uniform velocity, temperature, and pressure. Concentration profiles which are obtained downstream of the "point" source with micro-sampling techniques and precise thermal-conductivity gas analysis are used to evaluate the molecular diffusion coefficient. It has been shown that the axial decay of trace gas is a simpler and more nearly precise method of measuring molecular diffusion coefficients than the related method of using composition profiles taken normal to the symmetry axis. Diffusion measurements at elevated temperatures have been made by heating the carrier gas. In addition, the presence of the trace gas in vanishing concentrations removes ambiguity arising from concentration effects normally encountered with conventional methods and permits this technique to be used to measure the maximum effect of concentration on the molecular diffusion coefficient by reversing the trace gas and carrier gas. The experimental equipment is simple in construction and operation and can be used for a wide variety of gases and physical conditions. Precision of the method is about $\pm 1\%$.

Binary diffusion coefficients for the gas pairs He-N₂ and CO₂-N₂ have been measured at one atmosphere pressure over a temperature interval 300-1150°K. Wherever possible, the results have been compared with accurately measured values reported in the literature, and the comparison shows good agreement. The measurements have been analyzed in terms of intermolecular potentials.

The interaction between a helium atom and a nitrogen molecule has been represented by a potential energy function corresponding to point centers of repulsion,

$$\phi_{\text{He-N}_2}(r) = 2.26 \times 10^{-9} / r^{10.45} \text{ ergs,}$$

valid for r between 2.33Å and 2.63Å. This potential has been compared with a similar potential evaluated from small-angle scattering experiments. Although these potentials are valid over molecular separations that do not quite overlap, only a slight extrapolation is required to show good agreement between the results of these entirely different experimental approaches. Especially encouraging is the excellent comparison between the actual measurements in the temperature range 300-1150°K and the predicted high-temperature diffusion coefficients valid in the

range 1300-7500°K provided by a rigorous kinetic theoretical interpretation of the scattering potential. The combined results show that the diffusion coefficient for this gas pair can safely be estimated from room temperature to temperatures where the nitrogen molecules would show appreciable dissociation ($T \approx 5000^\circ\text{K}$).

The N₂-CO₂ diffusion measurements have been used to evaluate parameters for the Lennard-Jones (12-6) potential. These parameters have been compared with those computed from classical combining rules and the respective parameters for pure components obtained from viscosity measurements.

It is shown that the prediction of high-temperature diffusion coefficients based upon the Lennard-Jones (12-6) potential and viscosity parameters can be in significant error.

The maximum effect of composition on the molecular diffusion coefficients of the gas pairs He-N₂, N₂-CO₂, and He-A have been measured at room temperature and atmospheric pressure by reversing the trace gas and carrier gas. It has been shown that the rigorous kinetic theory correctly predicts this effect for the He-A gas pair--these atoms have spherically symmetric force fields as required by the theory. When the field of force about a molecule becomes asymmetric, such as for the N₂ molecule in the He-N₂ interaction, it has been shown that the theory is only qualitatively correct in predicting the effect of composition on the diffusion coefficient. This same effect is predicted to be quite small for the N₂-CO₂ gas pair and no effect was observed experimentally.

Microfilm \$2.50; Xerox \$4.80. 94 pages.

PHYSICS, ELECTRONICS AND ELECTRICITY

PRE-BREAKDOWN FIELD EMISSION CURRENTS AND TIME LAGS IN SPARKS BETWEEN METAL ELECTRODES IN HIGH VACUUM

(L. C. Card No. Mic 60-489)

Leonard Aronowitz, Ph.D.
New York University, 1957

Adviser: Professor Leon Fisher

The present work was undertaken in order to investigate the mechanism of the initiation of sparks between metal electrodes in high vacuum. Breakdowns at voltages below 50 kv were studied in gaps of point cathode, plane anode geometry and crossed wire geometry at pressures from 10^{-6} mm to 5×10^{-9} mm. Electrodes of tungsten, platinum, and nickel plated steel were investigated. The relationship between field current and gap voltage was measured. Measurements of breakdown time lags were made. Time lags from less than 0.2 μ sec to as long as 40 μ sec were observed.

Unsuccessful attempts were made to stabilize the breakdown threshold voltage of vacuum spark gaps. No improvement in the reproducibility of threshold voltage was obtained as a result of outgassing the electrodes,

placing protective resistances up to 0.1 meg in series with the gap to limit current flow during breakdown, or by maintaining the electrodes at a temperature of approximately 1,200°C. Because of the inability to stabilize threshold voltage no relationship between time lags and gap over-voltage could be established. When the field current and voltage data were compared with the Fowler-Nordheim field emission equation it was found that the currents originated from areas on the cathode surface where the electric field was more intense than the average electric field at the cathode surface. This intensification of the electric field was presumably caused by projections on the cathode surface. It was found that in some cases the fields at the cathode surfaces were intensified by these projections by a factor of from 10 to 400 times compared to the field at a smooth cathode surface. The size of the field current emitting areas was found to be only 10^{-9} cm² to 10^{-13} cm². Extrapolation of the field current and voltage data which was taken at voltages below breakdown to threshold voltage yielded field current densities of 10^6 amp/cm² to 10^8 amp/cm² at the emitting areas at breakdown voltage.

The long lags which were measured and the high current densities at the cathode led to the conclusion that the initiating factor for vacuum sparks may be the melting or vaporization of the projections on the cathode from which the field current is emitted. According to this hypothesis the observed time lags were the time required for sufficient Joule heating of the emitting areas on the cathode to take place. It was shown that the time lags to be expected from this mechanism are inversely proportional to the square of the field current density. Calculations were made of the time lags to be expected from this mechanism and these were compared with the measured lags. The agreement was good considering the approximate nature of the calculations. Microfilm \$2.50; Xerox \$4.60. 88 pages.

CURRENT AND TIME STUDIES OF THE POSITIVE POINT-TO-PLANE CORONA IN H₂, N₂, O₂, AND ARGON.

(L. C. Card No. Mic 60-494)

Lawrence A. Bornstein, Ph.D.
New York University, 1957

Adviser: Professor Leon H. Fisher

On the basis of very short observed formative time lags of spark breakdown in uniform fields at high pressures, a theory of breakdown was developed involving the fine filamentary streamers seen in corona discharges in air. This streamer theory invoked propagation of the spark by photons, and predicted the fast build-up times observed. Subsequent measurements in uniform fields near threshold with highly stabilized voltages revealed time lags too long for the streamer theory, which was then abandoned for the region near threshold. However, formative time lag measurements of the positive point-to-plane corona discharge in air at threshold disclosed so fast a build-up for filamentary streamers as to preclude the cathode from taking part in the build-up process. A gas-dependent mechanism, possibly a streamer theory, was required in air coronas.

This discrepancy between the behavior of discharges in uniform and nonuniform fields has led to the present effort at determining whether there is a consistency in corona discharges in various gases under a variety of conditions. A systematic study of the pre-onset currents and formative time lags of the positive point-to-plane corona discharge has therefore been carried out in hydrogen, nitrogen, oxygen, and argon. These gases have been investigated at pressures ranging from 700 mm Hg down to 10 mm Hg, with gap lengths between 0.50 and 1.50 cm, using tungsten points in the shape of paraboloids (with one a hemispherically-capped cylinder) having radii ranging from 0.0091 to 0.0719 cm. Brass and nickel cathodes have been employed. Primary electrons are supplied by irradiation of the cathode with ultraviolet light. Currents are measured with various voltages on the point with the cathode grounded, using a high input impedance electrometer which reads the voltages those currents develop across known resistors. Formative time lags are observed (with the exception of those in nitrogen at low overvoltages) by oscilloscope which is triggered by the same circuit which shorts out a positive approach voltage on the cathode, thereby creating a voltage step. Lags in nitrogen at low overvoltage were measured using a stopwatch which times the interval from the application of ultraviolet irradiation to the establishment of a self-sustained discharge.

The results obtained show that no two of the gases studied behave in even approximately the same way in all details. Current-voltage measurements indicate that a secondary mechanism involving the cathode is likely in dc steady-state currents in most gases. Formative lags at threshold range from less than 0.01 microsecond in hydrogen and argon, to 0.1 second in oxygen, to many minutes in nitrogen. In the first two, positive ions are excluded as important in the build-up process; in the last two, they are probably dominant. Computations of primary gas multiplications in dc currents lead to computed values of a second Townsend coefficient active at the cathode which agree fairly well with those obtained by different methods in other geometries in hydrogen, nitrogen, and argon.

Certain observations have strongly suggested that an overabundance of ultraviolet irradiation inhibits corona discharges, resulting in smaller currents, less likelihood of spark breakdown near threshold, and a change in the form of the discharge. These effects are attributed to distortion of the field by space charge resulting from large photoelectron production.

Microfilm \$2.50; Xerox \$6.80. 142 pages.

DETERMINATION OF THE OPTICAL ACTIVATION ENERGY OF ELEMENTAL BORON

(L. C. Card No. Mic 60-344)

James John Krebs, Ph.D.
St. Louis University, 1959

The effect of alpha particle bombardment on the photoconductivity of elemental boron has been studied. The boron specimens were obtained from the vapor-phase reduction of diborane gas (B₂H₆), in the vicinity of a heated

tantalum ribbon. All the samples used in this experiment were deposited at 1250°C. The alpha particle source used could be turned in or out of irradiating position by means of an external magnet.

Radiation from a 500-watt projection lamp used as a source for a Perkin-Elmer Model 83 monochromator was focused on the sample. The wavelength calibration and the spectral distribution of the light source were determined by means of a bridge circuit, two arms of which were lead-sulphide photodetectors. A Beckman Model V micro-microammeter together with a Brown Electronik recorder were used to measure the change in resistance of the sample.

The Po^{210} source of alpha particles had an activity of 5 millicuries and a half-life of 138 days.

In spite of the fact that the calculated density of defects introduced by the bombardment is almost two orders of magnitude larger than the original density of current carriers estimated from conductivity data, no effect on either the magnitude or the spectral distribution of the photosensitivity was observed. The explanation of this lack of change is thought to lie in the presence of intercrystalline barriers which result in an underestimation of the amount of current carriers initially present.

The optical energy gaps found for the four samples are 1.566, 1.548, 1.548, and 1.568 eV with an average value of 1.558 ± 0.062 eV. In addition to the above energy gap values, a second set of transitions was found for each sample involving transition energies of 0.839, 0.878, 0.824, and 0.893 eV. The average value is 0.858 ± 0.026 eV. For one sample a third set of transitions was found at an energy of 0.752 ± 0.020 eV.

Although it was not possible to detect any real change in the photoconductivity due to alpha particle irradiation, the investigation has yielded consistent information on the optical activation energy of boron. The average optical activation energy for 1250°C samples was found to be 1.56 ± 0.06 eV, which is in good with Shaw's value of 1.58 ± 0.05 eV obtained by thermal means for single crystals of boron.

Microfilm \$2.50; Xerox \$4.80. 92 pages.

THE DRIFT AND DIFFUSION OF ACTIVATOR CENTERS IN OXIDE-COATED CATHODES

(L. C. Card No. Mic 59-6382)

Koji Okumura, Ph.D.
University of Missouri, 1959

Supervisor: Eugene B. Hensley

The diffusion of activator centers in layers of (BaSr)O coated on platinum ribbons was measured using observations of the thermionic emission distribution along the coating. A peaked initial distribution was obtained by attaching a nickel activator to the middle of the ribbon. The activation energy and the diffusion coefficient at 1000°K obtained were 0.4 eV and $3 \times 10^{-7} \text{ cm}^2 \text{ sec}^{-1}$ respectively. Comparison with previously reported diffusion data showed that the diffusion of the activator centers was not consistent with that for oxygen ion vacancies but was in agreement with data obtained for the diffusion of barium isotopes. A model, referred to as the mobile acceptor hypothesis,

was developed to explain the ionic properties of oxide cathodes.

The electrolytic activation of an oxide cathode was studied by observing the variations in the electrical conductivity and the current versus voltage characteristics of the layers of (BaSr)O coating sandwiched between two pure planar nickel electrodes. The activation was found to proceed in steps during which the current versus voltage characteristics of the layers showed characteristic variations. The results were found to be reasonably explainable in terms of the mobile acceptor hypothesis referred to above.

Microfilm \$2.50; Xerox \$5.40. 108 pages.

PHYSICS, METEOROLOGY

APPLICATION OF WAVE FORECASTS TO MARINE NAVIGATION

(L. C. Card No. Mic 60-505)

Richard W. James, Ph.D.
New York University, 1957

Adviser: Dr. W. J. Pierson, Jr.

The effects of currents, wind and waves on ship propulsion are discussed. It is shown that the most important term in the overall loss of ship's speed is wave action. This action works two ways; through the direct resistance to movement of the ship, and indirectly through the voluntary reduction in speed necessitated by violent motions of pitch, heave, and roll. Methods are shown for the utilization of synoptic and prognostic wave charts in the selection of an approximate least time track, and examples of tracks used by commercial steamship companies are given. Some secondary applications of wave charts are illustrated by examples.

Microfilm \$2.50; Xerox \$5.20. 105 pages.

STUDY OF A RELATION BETWEEN GEOMAGNETIC ACTIVITY AND METEOROLOGICAL PARAMETERS IN THE ALASKAN AREA

(L. C. Card No. Mic 60-338)

Anthony Lawrence Julius, Jr., Ph.D.
St. Louis University, 1959

Although interest in the effects of solar activity on meteorological conditions had begun about thirty years ago, this interest has gained its greatest momentum in the last five years. Research in solar-weather relationships can be divided into two main categories: statistical and theoretical. Most of the work carried out has been of the former type since not enough is known of the physical nature of the upper atmosphere to warrant satisfactory theoretical work at the present time. Future scientific probe

by rocket and satellite measurements of the upper atmosphere should yield data which will be sufficient to open more avenues in the theoretical approach. Voluminous studies have previously been made relative to the solar-weather problem, both statistical and theoretical. These studies have been carried out over practically all parts of the world with results pertaining to the particular localities under study.

To study the effects of the sun on the weather requires a knowledge of the solar and geomagnetic parameters, an understanding of the mechanisms involved in transporting energy from low atmospheric pressures to the troposphere, and a knowledge of the response of the troposphere to this energy transfer. The last point, which is approached statistically here, is the main concern of this research. A study of absorption by oxygen between 10 and 55 km shows that the atmosphere more readily absorbs higher energy quanta at greater heights, whereas quanta of less energy are absorbed at lower levels. A study is made of the possible relation of the reception of solar particles by the earth's atmosphere, as indicated by the Ap index, to sea level pressure and upper flow patterns at 500 mb in the Alaskan area for a period of relatively high solar activity and a period of relatively low solar activity. From the statistical results it is found that significance at less than the five per cent level exists between a disturbed geomagnetic field and mean twenty-four hour sea level pressure falls and twenty-four hour decreases of the mean meridional flow at 500 mb for the seventh to eighth day period after the disturbed field during the fall and winter of high solar activity period. The correlation coefficients expressing the degree of such relation are significant at less than the five per cent level. Regression equations between daily changes in the Ap index and the above meteorological parameters are developed. No significance at less than the five per cent level is found for the twenty-four hour increases in the mean zonal flow for any period of time studied here.

Statistical significance at less than the five per cent level is found for maximum ridge occurrence to the east of the Alaskan area north of 60° N for the seventh and eighth day period after high geomagnetic activity during the fall through winter of high solar activity. An investigation of anticyclogenesis at sea level in the Alaskan area shows no statistical significance in the building up of high pressure after high geomagnetic activity for any time period of study made here. Microfilm \$2.50; Xerox \$6.80. 145 pages.

GEOMAGNETIC WESTWARD DRIFT AND IRREGULARITIES IN THE EARTH'S ROTATION

(L. C. Card No. Mic 59-6081)

Michael Grant Rochester, Ph.D.
University of Utah, 1959

Chairman: W. M. Elsasser

This paper deals with the mechanism of the westward drift of the irregular part of the Earth's magnetic field, which is caused by electric currents in the Earth's core. The Earth's mantle, by virtue of its weak electrical conductivity, is electromagnetically coupled to the core by the

opposing forces due to the penetration from the core into the mantle of two toroidal fields. One of these toroidal fields diffuses out from the deep interior of the core, where it is induced by the well-known dynamo mechanism. The other toroidal field is induced from the main dipole by the discontinuity in angular velocity at the core-mantle boundary corresponding to the observed drift. The Lorentz interactions of the currents producing these two toroidal fields with the main dipole provide mechanical couples on the mantle. The criterion for a steady rate of drift is that the two couples balance one another. The regional field sources, fixed in the highly conducting fluid of the upper core, are then swept westward relative to the mantle.

This mechanism, first developed by Bullard, is extended to include the magnetic coupling provided by the presence of the higher multipole fields. As these fields, attached to the fluid of the upper core, sweep through the mantle, corresponding toroidal fields are induced at the core-mantle boundary and diffuse out into the mantle. The Lorentz interactions associated with the presence of the higher harmonics bring about an additional retarding couple on the mantle. If the first six harmonics of the observed surface field are taken into account, the retarding couple is increased by a factor of 1.6 over that provided by Bullard's earlier model.

Time-dependent perturbations of the mantle-core coupling are investigated rigorously. The diffusion through the mantle of a change in magnetic field strength, introduced at the core boundary, changes the restoring forces coupling the mantle to the core and thus disturbs the rotation of the mantle in a way consistent with the requirement that the angular momentum of the core-mantle system be conserved. By Lenz's law this disturbance is such as to reduce the production of excessive toroidal fields at the core boundary, and to bring the mantle into equilibrium with the core once more. The tightness of the core-mantle coupling, which determines the rate at which the angular velocity of the mantle responds to a step-function disturbance in field strength, is increased by 60% over that afforded by Bullard's model. It is shown that reasonable fluctuations of the fields at the core boundary are capable of explaining changes in the length of the day at the rate of order 1 millisecond in 10 years.

The arguments of this paper provide additional evidence that the mean electrical conductivity in the bottom 2000 km of the mantle is at least 10^{-9} e.m.u. A summary of knowledge of the distribution of electrical conductivity with depth in the Earth is given in the Introduction.

Microfilm \$2.50; Xerox \$3.00. 59 pages.

PHYSICS, NUCLEAR

PROTONS FROM THE 14 MEV NEUTRON REACTION WITH ZIRCONIUM

(L. C. Card No. Mic 60-416)

Se Hee Ahn, Ph.D.
Northwestern University, 1959

Supervisor: James H. Roberts

The present research is an attempt to gain some information on the mechanism involved in the (n,p) reaction

for zirconium at 14.1 Mev by measurements of energy distribution, angular distribution, and total cross section of the emitted protons. Zirconium was chosen in order that the results obtained might be compared with the previous results of the (n,n') reaction for the same neutron energy. In recent years the neutron and proton induced nuclear reactions in medium and heavy nuclei at intermediate energy have been studied. These results can be grouped within the two extremes, interaction through a compound nucleus and direct interaction. However, it is still difficult to say which of the two mechanisms is more significant.

A tritium gas target was used as a 14.1 Mev neutron source, utilizing the reaction $T^3 + D^2 \rightarrow He^4 + n^1 + 17.578$ Mev, with the Northwestern University 5 Mev electrostatic accelerator. The gas target assembly consisted of two cells, one containing the tritium, and one containing a hydrogen-helium gas mixture for cooling the two 0.0004 inch molybdenum foils. The neutron beam was collimated by a 24 inch stack of steel plates with an hourglass shaped hole. Ilford G-special 400 micron emulsion plates were exposed using a multiple plate camera which was shielded by paraffin. The incident time-integrated neutron fluxes were measured by counting the positrons from Zr^{90} which was obtained by the reaction $Zr^{90}(n,2n)Zr^{89}$. The neutron flux at the target position was 5.71×10^8 neutrons per cm^2 for the background run, 7.76×10^8 neutrons per cm^2 for the zirconium run. A total of about 350 tracks for the background and about 1000 tracks for the exposure with target were measured.

The energy distribution of protons from the (n,p) reaction peaks between 2 and 3 Mev, which is higher than for neutrons from the (n,n') reaction. This was expected since the Coulomb barrier reduces the emission probability of charged particles at low energy. The proton energy distribution is predicted from a statistical model calculation in which a penetration factor is obtained by assuming a Woods-Saxon type diffuse nuclear potential and by assuming a square well. Much better agreement with experiment is obtained for the diffuse potential than for the commonly used square well.

The angular distribution of protons with energy up to 8 Mev appears to be symmetric about 90° with respect to the beam direction; whereas that of protons with higher energy than 8 Mev show a peak in the forward direction. According to the statistical model of the compound nucleus, the angular distribution is symmetric about 90° when averaged over a sufficient number of levels, and according to the direct interaction theory, the angular distribution has a forward peak. By taking the total cross sections for protons emitted below 8 Mev and for those emitted above 8 Mev, it is estimated that about 90% result from interaction through a compound nucleus, and 10% result from a direct interaction process.

The total cross section for the emission of protons from the zirconium is found to be 87 ± 22 mb. This value is about 10 times the value calculated by using a compound nucleus model with square well potential; however, by taking a diffuse nuclear potential instead of square well potential, the observed value of the total cross section is about twice the calculated value. This point suggests that the diffuse nuclear potential is probably a better approximation to the truth than the square well potential. This agrees with the conclusions drawn from the energy distribution.

Microfilm \$2.50; Xerox \$4.60. 89 pages.

CHANGES IN TRAPPING LEVELS OF ZINC SULFIDE PHOSPHORS RESULTING FROM POSITIVE ION BOMBARDMENT

(L. C. Card No. Mic 58-7206)

William Theodore Allen, Ph.D.
Syracuse University, 1958

Measurements were made of the changes in trap distribution of the surface of ZnS:Ag phosphor as a result of bombardment by 12,000 electron volt positive ions of argon, hydrogen and oxygen.

The method used, which was particularly sensitive to changes in the trap distribution near the surface of the crystals, involved alternately flashing the phosphor with very weak ultra-violet for 0.02 seconds and cutting off the ultra-violet for 0.02 seconds. Measurements of the phosphorescent light as a fraction of the emitted light under steady excitation were made 5 milliseconds after cutoff of the exciting ultra-violet at various temperatures from -190 degrees centigrade to +120 degrees centigrade.

The data was plotted as a function of temperature and the resulting curves were called I/I_0 vs temperature curves. The I/I_0 vs temperature curve for a standard un-bombarded phosphor was subtracted from the I/I_0 vs temperature curves for ion-damaged phosphors. The curves thus obtained were called I/I_0 difference vs temperature curves, and were used to study differences in trap distribution as a result of ion bombardment.

On theoretical grounds, if traps exist at discrete levels, peaks representing these levels will occur in the I/I_0 vs temperature curves. Also, if traps at discrete levels are caused by ion bombardment, peaks representing these levels will occur in the I/I_0 difference vs temperature curves. These peaks should be related to trap depth by the relation $E = 13.1 kT$, where E is the trap depth, k is Boltzmann's constant, and T is the temperature in degrees Kelvin at which the peak occurs.

The results showed that bombardment by ions caused an increase in the number of traps at the lowest trapping level, 0.28 electron volts deep, as well as the creation of new traps at depths slightly greater and slightly less than 0.28 electron volts. This effect was independent of the ion used for bombardment.

In addition, ion bombardment caused new traps to appear at deeper trapping levels, the depth of which was dependent on the ion used for bombardment. These new trapping levels were 0.37 electron volts for Ar^+ ion bombardment, 0.38 electron volts for H_2^+ ion bombardment, and 0.39 electron volts for O_2^+ ion bombardment. For the latter, the peak in the difference curve is quite sharp and clearly located at 345 degrees Kelvin, locating its depth at 0.39 electron volts. Since this depth corresponds to the next trapping level with increasing depth reported in the literature (R. H. Bube, Physical Review, 90, p. 70, 1953), it is indicative that this trapping level is caused by the presence of oxygen in ZnS phosphors.

Microfilm \$2.50; Xerox \$4.00. 72 pages.

SLOW NEUTRON SCATTERING BY ANISOTROPIC MATERIALS

(L. C. Card No. Mic 60-323)

Richard Roy Boedeker, Ph.D.
St. Louis University, 1959

The isotropic Einstein model of R. M. Delaney (*Bulletin of the American Physical Society*, Series II, No. 2, April 25, 1957, 202), in which the total (4π) slow neutron scattering cross section due to all possible processes of phonon exchange between neutron and nucleus was obtained, has been extended to anisotropic materials yielding an expression for the neutron cross section of such materials.

In the present work, the general expressions for the case of a completely anisotropic substance are developed by using distinct Einstein temperatures for each of the three spatial directions. The interaction between the nucleus and the neutron is represented by the Fermi pseudopotential. The total (4π) neutron scattering cross section can be expressed as the sum of the elastic coherent cross section, the elastic incoherent cross section, the inelastic incoherent phonon emission cross section, and the inelastic incoherent phonon absorption cross section.

The expressions discussed above are then specialized to the case of two distinct Einstein temperatures, one of which is used for two spatial directions, so that the results can be compared with cross section data on graphite, a material with crystallographic properties suggesting such limited anisotropy.

A comparison is made with experimental results by examining neutron cross section data on graphite from Brookhaven National Laboratory (U. S. Government Printing Office Document BNL 325, second edition). The Einstein temperatures are found by matching theory and experiment for one value of energy and sample temperature.

The anisotropic Einstein model cross section here developed is found to give results approximately 20 percent closer to the experimental data than the anisotropic Debye model cross section (developed by L. S. Kothari and K. S. Singwi) as long as the sample temperature is at least as high as the average Einstein temperature. Even for sample temperatures some 10 percent below the average Einstein temperature, (where the model itself begins to fail) the Einstein cross section is approximately 15 percent closer to the data than the Debye cross section. This is probably due to the many approximations that had to be made in the derivation of the anisotropic Debye cross section so that manageable numerical calculations could be made. No approximations have been made in the present work employing the Einstein model.

It is found also that the anisotropic Einstein cross section gives results slightly closer (about 1 percent) to experimental data than the isotropic Einstein cross section. An investigation of the difference between the anisotropic and isotropic Einstein cross sections for different Einstein temperatures is made by matching the two models at a sample temperature at least as high as the average Einstein temperature, and then calculating the cross section difference for a sample temperature some 30 percent lower than the match point. It is found that the difference increases with increasing Einstein temperature. (A difference of approximately 1.5 percent exists for a sample temperature of 1100°K and an average Einstein temperature of 1500°K.)

Hence it follows that experimental tests of the present anisotropic theory should be made for an appropriate material with a high average Einstein temperature and for which accurate data (accurate to about 1 percent) exists. A thorough search of the literature was made, but no useful data was found.

Microfilm \$2.50; Xerox \$5.00. 97 pages.

A STUDY OF THE DECAY OF SEVERAL ISOTOPES OF PROMETHIUM AND EUROPIUM

(L. C. Card No. Mic 60-733)

John Allan Eisele, Ph.D.
The Ohio State University, 1959

Six samples of neodymium oxide, each of which was enriched in one of the stable isotopes Nd^{143} , Nd^{144} , Nd^{145} , Nd^{146} , Nd^{148} , and Nd^{150} , and four samples of samarium oxide, each of which was enriched in one of the stable isotopes Sm^{147} , Sm^{148} , Sm^{149} , and Sm^{150} , were bombarded with 6 Mev protons in the cyclotron belonging to the Ohio State University. All samples became radioactive and the accompanying gamma-ray spectra were measured by using the methods of scintillation spectrometry. In each case the nuclear specie responsible for the activity was identified as either an isotope of promethium or europium.

The Decay of Europium-148 and Promethium-148

Eu^{148} decays into Sm^{148} by electron capture. The half-life is 54 ± 1 days. The gamma-rays accompanying the decay have energies of 420 ± 5 kev, 560 ± 5 kev, 570 ± 5 kev, 630 ± 5 kev, 740 ± 5 kev, 1190 ± 10 kev, 1370 ± 15 kev, and 1625 ± 15 kev. Pm^{148} decays into Sm^{148} by beta-emission. The half-lives for Pm^{148} are 5.5 ± 0.1 days and 50 ± 1 days. The gamma-rays accompanying the decay have energies of 290 ± 5 kev, 420 ± 5 kev, 560 ± 5 kev, 630 ± 5 kev, 740 ± 5 kev, 910 ± 10 kev, 1005 ± 10 kev, 1470 ± 15 kev, and 1610 ± 15 kev. Energy levels in Sm^{148} are 560 ± 5 kev, 1190 ± 10 kev, 1470 ± 15 kev, 1610 ± 15 kev, and 2170 ± 20 kev.

The Decay of Europium-147

Eu^{147} decays into Sm^{147} by electron-capture. The half-life is 24 ± 1 days. The gamma-rays accompanying the decay have energies of 70 ± 2 kev, 118 ± 2 kev, 188 ± 3 kev, 615 ± 5 kev, 680 ± 5 kev, 800 ± 10 kev, 875 ± 10 kev, 930 ± 10 kev, and 1060 ± 10 kev. Energy levels in Sm^{147} are 118 ± 2 kev, 188 ± 3 kev, 800 ± 10 kev, and 1060 ± 10 kev.

The Decay of Promethium-143

Pm^{143} decays by electron-capture. The single gamma-ray accompanying the decay has an energy of 740 ± 5 kev.

The Decay of Promethium-144

Pm^{144} decays into Nd^{144} by electron-capture. The gamma-rays accompanying the decay have energies of 485 ± 5 kev, 630 ± 5 kev, 695 ± 5 kev, and 1325 ± 5 kev. Energy levels in Nd^{144} are 695 ± 5 kev, 1325 ± 10 kev, and 1810 ± 15 kev. Pm^{144} does not decay into the 2180 kev energy level in Nd^{144} .

The Decay of Promethium-146

Pm^{146} decays into Sm^{146} by beta-emission with a half-life of 3.5 years. Pm^{146} also decays into Nd^{146} by electron-capture. The gamma-rays accompanying the electron-capture have energies of 450 ± 5 kev and 750 ± 5 kev. Energy levels in Nd^{146} are 450 ± 5 kev and 1200 ± 10 kev.

The Decay of Europium-149

Eu^{149} decays into Sm^{149} by electron-capture. The gamma-rays accompanying the decay have energies of 287 ± 3 kev, 319 ± 3 kev, 405 ± 5 kev, 532 ± 5 kev, 607 ± 5 kev, and 1190 ± 10 kev.

The Decay of Europium-150 and Promethium-150

Eu^{150} decays to the ground state of Gd^{150} by beta-emission. Eu^{150} also decays into Sm^{150} by electron-capture and by positron-emission. The half-life for Eu^{150} is 12.5 ± 0.1 hours. The gamma-rays accompanying the decay have energies of 340 ± 3 kev, 420 ± 4 kev, 760 ± 7 kev, 1150 ± 10 kev, 1660 ± 15 kev, and 2020 ± 20 kev. Pm^{150} decays into Sm^{150} by beta-emission. The half-life of Pm^{150} is 2.7 ± 0.1 hours. The gamma-rays accompanying the decay have energies of 340 ± 3 kev, 420 ± 4 kev, 760 ± 7 kev, 840 ± 8 kev, 1150 ± 10 kev, 1300 ± 10 kev, 1660 ± 15 kev, and 2000 ± 20 kev. Energy levels in Sm^{150} are 340 ± 3 kev, 760 ± 7 kev, and 2000 ± 20 kev. Microfilm \$2.50; Xerox \$5.60. 115 pages.

A CLOUD CHAMBER SEARCH FOR SUB-IONIZING PARTICLES

(L. C. Card No. Mic 60-276)

Md. Bazlul Haque, Ph.D.
University of Alabama, 1958

A further study for the search of relativistic sub-ionizing particles from external radio-active source was conducted with the help of a cloud chamber (Bearden Chamber). The source strength used was of the order of 6-microcuries of radium. The sub-ionizing particles are classified as either free magnetic poles or relativistic charged particles. The limiting value of the sub-ionizer charge was assumed to be within $1/2$ to $1/6$ of the electronic charge. The chamber had a long sensitive time and the process of multiple photography per expansion was adopted. 40% of the total expansions were found to be free from background effect. On the whole, conditions were attained in such a way as to record a background level two orders of magnitude lower than attained before. Detailed explanations of the importance of long sensitive time and very low background level are given. Discussions are made of the factors which limit the useful portion of the sensitive time per expansion. The basic factors for selecting those photographic records which may clearly indicate the presence of a sub-ionizing particle are emphasized.

Curves showing track-load -, track droplet density -, and background density -, all against the expansion time are shown. Discussions are also made showing clear distinction between different classes of chamber expansions.

After a thorough and careful study of the numerous suspected tracks, five tracks were found to withstand all the tests and still looked quite suspicious, as though they might be due to sub-ionizers. Four of these tracks appeared distinctly on three successive frames and the fifth one on four successive frames.

Comparative counts were made on the same photographs of typical electron tracks and of the suspected tracks. The lengths of the tracks were found to range from 2.89 cm. to 3.67 cm. The average number of drops per cm. of length was found to be 3.75 for one group of suspected tracks (averaged over three tracks), and 4.197 for the other group of tracks (averaged over two tracks).

The distribution of ions along the path was subjected to Poisson's distribution and apparently they follow this distribution.

Though it is not possible to classify the suspected tracks as due to new particles, these tracks are different in that they have a droplet density less than one-tenth of that in tracks of the same photographs which seem to be due to the electrons.

The only probable way to settle the question of these suspects would be an exhaustive search with the chamber in a strong magnetic field. Since the present study has yielded some definitely suspected tracks, we would like to advise to repeat the entire procedure with the chamber in a strong magnetic field.

Microfilm \$2.50; Xerox \$4.40. 83 pages.

THE POLARIZATION OF COSMIC RAY MUONS AT SEA LEVEL

(L. C. Card No. Mic 59-6939)

Clarence Scott Johnson, Ph.D.
Washington University, 1959

Chairman: Robert D. Sard

Positive cosmic ray muons observed at sea level have been found in previous experiments^{1,2} to be partially longitudinally polarized. The object of this experiment was to make an accurate determination of the magnitude of this polarization.

The method employed was to stop muons in a thin copper absorber and observe the up:down asymmetry in the $\mu^+ \rightarrow e^+$ decay electrons. Stopping muons are selected by a coincidence-anticoincidence counter telescope, and the decay electrons are detected by means of identical scintillation counters placed above and below the absorber. The up:down ratio, R , is related to the magnitude of the muon polarization, $|\delta|$, by:

$$R = \frac{1 + a|\delta|}{1 - a|\delta|},$$

where

$$a = 0.31 \pm 0.01.$$

" a " is an asymmetry coefficient depending upon the finite geometry of the experimental apparatus and the energy of the detected electrons. This coefficient has been evaluated assuming the two-component neutrino theory³ to be correct, using the Washington University IBM-650 Data Processing Machine.

Copper was selected as an absorber because previous experiments⁴ using magnetic fields have indicated that it does not depolarize muons appreciably. However, the results of the present experiment suggest that in the absence of external magnetic fields copper does destroy the muon polarization to some degree. In order to check the apparatus iron and sulphur were used as control absorbers. Sulphur has been found by previous experiments⁵ to depolarize completely; and we have verified the suggestion⁶ that iron depolarizes by reason of the large magnetic fields of the domains. For iron and sulphur one expects 1.0 for the up:down ratio.

The measured up:down ratios are: 1.14 ± 0.02 for copper, 0.98 ± 0.02 for iron, and 1.02 ± 0.03 for sulphur. Using the copper up:down ratio the magnitude of the muon polarization at the time of disintegration is found to be: $|\delta| = 0.21 \pm 0.03$. This figure is a lower limit on the polarization at production because of depolarization by the atmosphere and the copper absorber. The depolarization in the atmosphere is expected to be about 5%.⁷ There appears to be depolarization in the copper, indicated by a decrease in the up:down ratio with time, but our limited statistics prevents a quantitative determination of the effect. An additional experiment measuring its magnitude will be required before the results can be corrected.

Assuming the parent pion energy spectrum to be of the form:

$$N(\eta)d\eta = (\text{const.})\eta^{-\gamma} \frac{d\eta}{\eta},$$

where η is the total pion energy, the value of γ can be calculated from $|\delta|$. Using $|\delta| > 0.21 \pm 0.03$ we obtain $\gamma > 1.3 \pm 0.3$, which is consistent with other values^{1,8}.

Microfilm \$2.50; Xerox \$4.60. 90 pages.

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TOTAL NEUTRON CROSS SECTION MEASUREMENTS BY THE SELF-INDICATION TECHNIQUE

(L. C. Card No. Mic 60-340)

Clyde William Kimball, Ph.D.
St. Louis University, 1959

The self-indication technique can be so adapted that it is a useful modification of the transmission experiment for the measurement of neutron cross sections. In the present investigation, two similarly constructed systems for the detection of neutrons are placed at equal radial distances from the Li(p,n) neutron source and at equal polar

angles (30°) with respect to the line defined by the proton beam from the Van de Graaff electrostatic generator. Both systems thus receive the same incident flux. One serves as a monitor, the other as the counter. The neutrons which are detected are those which a detector sample of the element under investigation scatters into an array of BF₃ proportional counters immersed in an oil moderator. This detection system subtends a solid angle of almost 4π at the detector sample and its efficiency for the detection of neutrons is approximately constant over the energy range from 24 kev to several Mev.

An experimental measurement consists in obtaining the number of counts (normalized to the count of the monitor) when a given transmission sample attenuates the neutron flux and a given detector sample is in the scattering chamber. At a given neutron energy, three sets of measurements are made. Each set consists of the 18 measurements corresponding to the possible combinations of 6 different thicknesses of transmission sample and 3 of detector sample. The combinations of sample materials which characterize the three sets are (1) carbon as both transmission and detector sample, (2) transmission sample of the element of atomic number Z and detector sample of carbon, and (3) element Z for both transmission and detector samples.

Five unknowns are sought: (1) the total cross section of carbon, (2) a parameter of the detection system, (3) the total cross section of the element Z under investigation, (4) the absorption cross section of the element Z, and (5) the second moment of the total cross section of the element Z. A least-squares analysis is applied to the 54 equations in five unknowns.

A large value of the second moment is an indication of unresolved structure within the 5-kev resolution used in these experiments. Hence, the self-indication technique may be used for rapid exploration of a wide range of energies with broad resolution to see if there is structure in the total cross section within this range.

The total cross sections of carbon, silver, and bismuth have been measured in the energy range from 100 to 317 kev and that of molybdenum from 203 to 317 kev. An experimental difficulty increased the error of the absorption cross section to approximately 125 mb and the error of the total cross section to ~2%. It is believed that the source of the difficulty has been found and that once it is eliminated the total cross section can be measured to within 1% and the absorption cross section to within 50 mb.

Microfilm \$2.50; Xerox \$8.40. 182 pages.

A MEASUREMENT OF THE LONGITUDINAL POLARIZATION OF PR¹⁴⁴ BETA-PARTICLES

(L. C. Card No. Mic 60-62)

Werner Alfred Wilhelm Mehlhop, Ph.D.
Washington University, 1959

Chairman: Professor T. A. Pond

A precision determination of the longitudinal polarization of the beta particles from radioactive Pr¹⁴⁴ is reported. The beta transition in Pr¹⁴⁴ being of the kind , a potential presence of the pseudoscalar interaction type

in beta decay would make itself felt in the predominant order of forbiddenness, a well known theoretical result. According to the "post-parity" formulation of the theory of beta decay, the presence of the P-interaction would, in particular, result in a decrease of the degree of longitudinal polarization of the emitted betas. Thus a precise measurement of the electron polarization allows one to draw conclusions upon the absence or presence of the P-interaction.

The polarization sensitive process utilized in this experiment is Møller-scattering, i.e. the scattering of free electrons by free electrons. For pure initial spin states, the cross section of this process is dependent upon the relative orientation of the two electron spins. Experimentally, one scatters the beta particles (polarized through their emission process) off a ferro-magnetic foil (whose electrons are (partially) polarized by application of an external magnetic field) and observes the percentage difference in the number of detected Møller-events upon reversal of the magnetizing field; this difference, as the explicit theory shows, yields quantitative information about the degree of polarization of the betas, provided the degree of polarization in the scatterer is known. The difficulty in obtaining a precise value of the latter is one of the reasons for not measuring the polarization of the Pr^{144} betas absolutely, but relative to the electron polarization in the decay of Y^{90} .

A major feature of the apparatus is the detection of the two final state electrons (the original one and the one knocked out of the foil) in fast coincidence; this technique, necessary to distinguish the relatively scarce Møller-events from the huge background of nuclear scatterings, at the same time discriminates against various undesired scatterings off chamber walls etc., all these scatterings being non-coincident. Because of the low count rate and the high desired statistical significance, the whole operation of the apparatus was automatized and the data analysis adapted for evaluation at the IBM 650 computer.

The thesis contains a thorough discussion of the two nuclei under investigation (Pr^{144} and the reference nucleus Y^{90}), especially from the point of view of small theoretical corrections potentially altering the simple $\frac{v}{c}$ -dependence of the polarization; further a critical evaluation of various experimental aspects, in particular a rather involved discussion of the occurrence of multiple scattering in the magnetic foil. All experimental corrections resulting from the latter investigation are pleasingly small, partly due to the relatively high energy range of the investigated electrons (1 Mev 3 Mev).

The result of the experiment may be summarized as follows: $\text{Pol}(\text{Pr}^{144})/\text{Pol}(\text{Y}^{90}) = 0.986 \pm 0.030$

or

$$\text{Pol}(\text{Pr}^{144}) = (0.986 \pm 0.030) \frac{v}{c}$$

This result is compatible with complete absence of the P-interaction, which is the point of view generally adopted in the theory of beta decay. Admitting, nonetheless, small admixtures of the P-interaction, an upper limit to the ratio of the relevant coupling constants, C_P/C_A , could be set on the basis of the error limits of the experiment.

Microfilm \$2.50; Xerox \$5.40. 109 pages.

EVIDENCE FOR A 525 m_e PARTICLE

(L. C. Card No. Mic 59-6526)

William H. Sandmann, Ph.D.
University of Utah, 1960

Chairman: Dr. J. W. Keuffel

A mass spectrometer utilizing two scintillators is developed. Pulse heights from these scintillators are shown to be related to the velocity and total kinetic energy of the particle. The computation of the masses is then reduced to an analytical form suitable for use with a desk calculator.

This spectrometer is used to search the secondary cosmic ray flux for a particle with a mass of 400 - 600 m_e . Additional electronic circuits are added to the spectrometer in an attempt to observe decays of particles in this region.

A very localized mass distribution is apparent at 525 m_e . The number of events in this peak is compared to the number of muons stopping in the same time and range interval. The resultant abundances for two runs under different amounts of absorber are:

$$A(172 \text{ g/cm}^2) = 0.043 \pm 0.018\%$$

$$A(516 \text{ g/cm}^2) = 0.038 \pm 0.017\%$$

All known mass backgrounds are carefully examined as possible sources of this mass distribution. It is concluded that these backgrounds are unable to produce this mass distribution.

It is concluded from the timing data that either the particles decay by an electron mode or compete with the muon modes. If they compete with the muon modes the data gives the following factor for a branching ratio times an abundance:

$$A'(\mu^+ + \pi^0) = 0.0075\%$$

$$A'(\mu^+ + 2\nu) = 0.018\%$$

$$A'(e^+ + 2\nu, e^+ + \pi^0) = 0.088\%$$

Microfilm \$2.50; Xerox \$3.80. 69 pages.

DOUBLE BETA-DECAY WITH INCOMPLETELY POLARIZED MAJORANA NEUTRINOS

(L. C. Card No. Mic 60-477)

Robert Craig Whitten, Jr., Ph.D.
Duke University, 1959

Supervisor: Eugene Greuling

According to the universal V - A Fermi interaction of Feynman and Gell-Mann double beta-decay without emission of neutrinos is absolutely forbidden if leptons are conserved and the neutrino mass is zero. Stated differently, the assumption of lepton conservation requires zero mass, one hundred per cent longitudinally polarized neutrinos. Since lepton conservation has not as yet been elevated to the status of an experimentally tested principle, however, it is considered at best to be a weak argument against neutrinoless double beta-decay.

In this thesis two ways are considered in which a Majorana neutrino created in the intermediate state may be reabsorbed in the final state to result in neutrinoless double beta-decay. Both require a deviation from complete longitudinal polarization of the created neutrino and thereby violate lepton conservation. The two alternatives are: (1) to assume finite neutrino mass, m_ν , and (2) to introduce a deviation from perfect helicity (measured by a parameter δ) of the lepton fields in the phenomenological interaction Hamiltonian. Neither alteration yields theoretical predictions which are contradicted by any experimental measurements of any of the first order beta-decay phenomena, but the predictions for the second order double beta-decay process presented in this thesis are significantly altered.

Starting with this slightly altered effective interaction, using Coulombic electronic wave functions, and approximating the sum over intermediate nuclear states by the method of closure, the two neutrino double beta-decay transition rate is recomputed. The predicted one and two electron kinetic energy spectrum is presented. The magnitudes and relative phases of the two interfering nuclear matrix elements encountered are estimated, and the mean lives of some eight possible double beta-decaying nuclei are calculated to range from about 10^{19} to 10^{22} years.

The transition rates for the competing neutrinoless double beta-decay processes are computed accurately for the first time. The necessary justification for the use of the closure approximation is presented. The spectrum of total kinetic energy carried away by the two emitted electrons is sharp. The continuous kinetic energy spectrum of one of the electrons is calculated using both plane wave ($Z = 0$) and Coulomb electron wave functions. The magnitudes of the three nuclear matrix elements encountered are estimated, and the effect of their possible interference on the transition rate is discussed.

Approximate simple formulae linear in m_ν^2 and δ^2 for the branching ratio between the two neutrino and neutrinoless modes of decay are presented. Two cases are considered: (a) $m_\nu = 4 \times 10^{-4}$ electron masses, and $\delta = 0$; (b) $m_\nu = 0$, and $|\delta| = 10^{-3}$.

The negative results ($\tau > 10^{18}$ years) of several experimental attempts to detect double beta-decay are not contradicted by the theoretical mean lives presented here. It is concluded that if future experiments establish the existence of the neutrinoless mode of decay, the principle of lepton conservation would be proved to be invalid. This would mean that the neutrinos created in the beta-decay process are not completely polarized and are either Majorana particles or a mixture of Dirac neutrinos and antineutrinos. Also the helicity of the lepton fields in the effective beta interaction is not perfect and/or the neutrino mass is non-zero.

Microfilm \$2.50; Xerox \$4.60. 87 pages.

COULOMB EXCITATION OF GERMANIUM AND SELENIUM

(L. C. Card No. Mic 60-478)

William Rowland Wisseman, Ph.D.
Duke University, 1959

Supervisor: R. M. Williamson

Deuterons and protons with energies from 3.5 to 4.0 Mev were used to Coulomb excite levels in Ge^{74} , Ge^{76} , and

Se^{77} . The scattered particles (elastic and inelastic) were studied with a magnetic analyzer at angles ranging from 75° to 150° . After passing through the magnetic analyzer, the scattered particles were detected on a 2" x 12" photographic plate which covered an energy interval which was 24 per cent of the central energy. The Coulomb excitation differential cross section was obtained by observing the ratio of the counts under the inelastic peak to those under the elastic peak and using the calculated differential Rutherford cross section. If Coulomb excitation is assumed to be the only mechanism acting, the reduced nuclear transition probability for excitation, $B(E2)$, can be calculated from the inelastic cross section. It was necessary to test the applicability of the Coulomb excitation theory in this region of the periodic table for the experimental conditions which existed. Good agreement with this theory was obtained for the angular distribution of the inelastically scattered deuterons from Ge^{74} with 3.8 Mev incident energy, and it was concluded that the classical Coulomb excitation theory was valid for this region of the periodic table for deuterons of this energy. Deviations from theory were observed for the energy dependence of the cross section for excitation of Ge^{74} with incident deuterons with energies of 3.8 Mev and higher. The ratio of the cross section obtained by using deuterons to that obtained by using protons was measured for all three isotopes, and deviations from the theoretically predicted values were observed. The deviations from theory were interpreted as arising from the occurrence of competing processes, and the values for $B(E2)$ obtained in this experiment were corrected for the effect of these processes. The results for $B(E2)$ along with the measured energies of the excited states are:

Ge^{74}	(598 \pm 6 kev)	0.34 \pm .03
Ge^{76}	(562 \pm 6 kev)	0.39 \pm .06
Se^{77}	(241 \pm 3 kev)	0.14 \pm .04
Se^{77}	(450 \pm 5 kev)	0.38 \pm .08

where $B(E2)$ is in units of $e^2 \times 10^{-48} \text{ cm}^4$. These results are in qualitative agreement with those obtained from thick target gamma ray measurements.

Microfilm \$2.50; Xerox \$3.60. 62 pages.

NUCLEAR CHARGE DISTRIBUTION IN FISSION: CUMULATIVE YIELDS OF ^{93}Kr , ^{94}Kr , ^{95}Kr , ^{97}Kr , ^{138}Xe , AND ^{142}Xe FROM THERMAL-NEUTRON FISSION OF ^{235}U .

(L. C. Card No. Mic 59-6946)

Kurt Wolfsberg, Ph.D.
Washington University, 1959

Chairman: Dr. Arthur C. Wahl

An emanation method has been used for the determination of the fractional cumulative yields of several short-lived krypton and xenon isotopes from thermal-neutron fission of ^{235}U . Highly emanating uranyl stearate was irradiated with thermal neutrons. The activities of relatively long-lived late members of the beta decay chains were determined from both the active deposit and the

uranyl stearate after chemical purification of the elements of interest. Comparison of the activities of a given nuclide in the two fractions gave the cumulative yield of the gas ancestor of that nuclide.

^{142}Xe was identified for the first time in this work by determination of ^{142}La in the active deposit.

The cumulative yield of 17-minute ^{138}Xe was measured by both emanation and gas-sweeping techniques.

SUMMARY OF CUMULATIVE YIELDS DETERMINED IN THIS WORK

Gas	Descendant determined	Fractional cumulative yield
^{92}Kr	$^{92}\text{Sr} \longrightarrow ^{92}\text{Y}$	$0.312^{(+0.016)}_{(-0.009)}^*$
^{93}Kr	^{93}Y	$0.075^{(+0.010)}_{(-0.003)}$
^{94}Kr	^{94}Y	$0.015^{(+0.004)}_{(-0.002)}$
^{95}Kr	$^{95}\text{Zr}(+^{95}\text{Nb})$	$[1.12^{(+0.20)}_{(-0.06)}] \times 10^{-3}$
^{97}Kr	$^{97}\text{Zr}(+^{97}\text{Nb})$	$\leq 7.0 \times 10^{-6}$
^{138}Xe	^{138}Cs	0.955 ± 0.005
^{142}Xe	^{142}La	$0.059^{(+0.006)}_{(-0.003)}$

*Wahl obtained a value of 0.31 ± 0.01 with highly emanating barium stearate.

The measured yields are only in fair agreement with those predicted by the various treatments of the postulate of equal charge displacement, but they appear to fall within the normal spread of deviations from the values predicted from a modified treatment of the postulate.

In this modified treatment of the postulate of equal charge displacement, the postulate is applied to fission products after prompt neutron emission, and the continuous Z_A function of Grummitt and Milton is used. This treatment gives the best general agreement for all measured fractional yields.

Microfilm \$2.50; Xerox \$5.00. 100 pages.

A COMPLEX NON-LOCAL DIFFUSE BOUNDARY INDEPENDENT PARTICLE MODEL OF NUCLEON-NUCLEAR SCATTERING AND BOUND STATE PHENOMENA

(L. C. Card No. Mic 59-6927)

Philip Joseph Wyatt, Ph.D.
The Florida State University, 1959

A unified description of the gross structure of nuclear bound states and neutron-nuclear scattering is attempted. Non-local diffuse-boundary independent particle model po-

tentials are utilized with the hope of having the potential parameters no longer explicitly dependent on energy.

Based on a modification of the earlier work of Frahn and Lemmer¹ and Green,² the present formulation introduces the concept of a complex effective mass. Assuming that the imaginary terms are essentially zero at negative energies, the formalism is shown capable of producing the expected shell structure, agreement between last particle eigenvalues and separation energies, and good scattering cross sections for a wide range of isotopes and energies. Additional consequences of the phenomenological analysis include the possibility of: a) shell and isotope effects on the nuclear parameters, b) a "rearrangement" energy which may vary from isotope to isotope and be from 0 to 6 MEV in magnitude, c) compound elastic cross sections of substantial consequence even at 14 MEV.

The calculations have been carried out with the aid of two IBM-704 codes. The first code yields predictions for neutrons in phenomenological potentials as to angular distributions, polarizations, various cross-sections, as well as transmission coefficients and complex phase shifts. The second code, an adaption³ of an earlier code for the ORNL ORACLE, gives bound state eigenvalues for both protons and neutrons in the corresponding potentials.

Microfilm \$2.50; Xerox \$4.40. 81 pages.

1. W. E. Frahn and R. H. Lemmer, *Nuovo Cimento* **5**, 1564 (1957); **6**, 664 (1957).
2. A.E.S. Green, *Revs. Modern Phys.* **30**, 569 (1958).
3. By John Wills of the Los Alamos Scientific Laboratory.

PHYSICS, SOLID STATE

A CALCULATION OF THE ELASTIC CONSTANTS OF YTTRIUM AND THE RARE EARTH METALS

(L. C. Card No. Mic 60-568)

Benjamin Tobias Bernstein, Ph.D.
Iowa State University of Science and Technology, 1959

Supervisor: John F. Smith

A modified cellular method developed by Raimis was extended to scandium, yttrium, and the rare earth metals. The assumption that the valence electrons are free and share the same ground state wave functions at zero wave number was capable of giving fairly good agreement between the calculated and experimental values of the atomic radii, compressibilities, and total energies of the trivalent rare earth metals as well as for scandium and yttrium. In addition the calculated variation of atomic radius and compressibility of the hexagonal rare earth metals with atomic number was in qualitative agreement with experiment. Calculations based on the assumption that europium and ytterbium are divalent in the solid state were capable of giving reasonable agreement with the observed atomic radii and compressibilities of these elements. Calculations for cerium did not give satisfactory agreement with the assumption of either a trivalent or quadrivalent atomic core. This failure probably results from the fact that the

assumption of equivalent behavior of the valence electrons at zero wave number is quite poor for this element. The compressibilities of promethium and scandium were predicted.

A calculation of the elastic shear constants of hexagonal close-packed yttrium at 0°K was made based on the assumption of nearly-free electron behavior for the valence electrons. The method developed by Reitz and Smith for hexagonal close-packed metals was applied. In order to obtain reasonable agreement with the experimental values it was assumed that electron overlap had occurred across the $\{1\bar{1}0,1\}$ and $\{000,2\}$ faces of the Brillouin zone and that there are an appreciable number of holes in the zone. The results are in agreement with the measured resistivity of single crystals of yttrium.

Microfilm \$2.50; Xerox \$6.00. 122 pages.

X-RAY COLORATION AND OPTICAL BLEACHING OF ALKALI HALIDE CRYSTALS

(L. C. Card No. Mic 59-6997)

Walter Ernest Bron, Ph.D.
Columbia University, 1959

A more complete understanding has been sought of the origin of the two stages in the formation of color centers, which are observed during room temperature coloration of alkali halides by ionizing irradiation. Information on the two stages in the formation of color centers was obtained by examining the changes in optical absorption during room temperature optical bleaching of undeformed and deformed crystals of KCl which had been irradiated with X-rays into either the first or second stage. A correlation is observed between the two stages of coloration of the F band and the previously observed two stages of bleaching which are obtained when the F band is illuminated with light lying in the F band. This correlation is such that the change in the F band absorption during the first stage of coloration approximately equals that during the first stage of bleaching, and consequently, that the change in F band absorption during the second stage of coloration approximately equals that during the second stage of bleaching. In addition, during bleaching with light in the F band, a correlation is also observed between the bleaching characteristics of the F band and the concurrent changes in absorption at the M band. Namely, the characteristic maximum in the absorption at the M band occurs at longer times and reaches a higher absorption the longer the initial X-irradiation. Both correlations are valid regardless of the state of deformation of the crystals. It is also found, in undeformed crystals irradiated only into the first stage of coloration, that the initial bleaching rate of F centers is proportional to the initial F band absorption, while in crystals irradiated into the second stage of coloration, the initial bleaching rate of F centers is approximately independent of the initial F band absorption. The first stage bleaching of F centers is found to be temperature dependent. However, no unique activation energy could be obtained for this process.

The experimental observations have been interpreted as follows. First stage coloration and bleaching, as observed at the F band, involves the formation and bleaching of normal F centers, whereas the second stages involve the

formation and bleaching of some other center. Although no definite identification of the center can be made at the present, it is possible that the second center is either an F center which is modified due to the presence of an M center in its immediate vicinity, or that it is the M center itself. First stage bleaching of F centers involves simultaneously the transfer of photoelectrons from F centers to pre-existing electron traps, and the transfer of electrons to potential secondary centers, such as M, R and N centers, which have been formed during bleaching through coagulation and migration of vacancies. The second stage of bleaching has tentatively been thought to involve the further coagulation and migration of these vacancies with the simultaneous movement of the assembly of vacancies toward the singularity lines of dislocations.

Microfilm \$2.50; Xerox \$7.60. 164 pages.

A NUCLEAR MAGNETIC RESONANCE STUDY OF ALIPHATIC FLUORIDES

(L. C. Card No. Mic 60-734)

Daniel Draudt Elleman, Ph.D.
The Ohio State University, 1959

Experimental values of the chemical shifts δ and of the spin-spin coupling constants J are reported for the resonances of F^{19} and H^1 in thirty-two aliphatic fluorides. The experiments were performed at room temperature with a 40 Mc/s high-resolution spectrometer.

It is found that there is a progressive displacement of the F^{19} resonance to lower magnetic fields in the series of chemical groups CH_2F , CF_2H , CF_2 , and CF_3 . The F^{19} resonance of octafluorocyclobutane was used as the F^{19} reference. The F^{19} resonances of the CH_2F groups have characteristic chemical shifts relative to the reference that are in the approximate range from $\delta_F = +109$ to $\delta_F = +77$. The F^{19} resonances of the CF_2H groups have chemical shifts that are in the range from $\delta_F = +39$ to $\delta_F = -26$, and the CF_2 groups have chemical shifts in the range from $\delta_F = -2.0$ to $\delta_F = -20.0$. The CF_3 resonances have chemical shifts in the range from $\delta_F = -43$ to $\delta_F = -73$.

The H^1 resonances exhibit smaller chemical shifts than the F^{19} resonances; however, the H^1 resonances show a progressive displacement to lower fields in the series of chemical groups CH_3 , CH_2 , CH_2F , CF_2H , $CFHCl$, and $CFHBr$. The H^1 resonance of a 10 per cent solution of H_2O in D_2O was used as a reference for the H^1 resonances. The H^1 resonances of the CF_2H groups have characteristic chemical shifts relative to the reference that are in the approximate range from $\delta_H = -0.2$ to $\delta_H = -1.2$. The H^1 resonances of the CH_2F groups have characteristic chemical shifts that are in the range from $\delta_H = +0.1$ to $\delta_H = +1.0$, and CH_2 groups have chemical shifts that are in the range from $\delta_H = +2.3$ to $\delta_H = +3.6$. The H^1 resonances of the CH_3 groups have chemical shifts in the range from $\delta_H = +2.7$ to $\delta_H = +4.2$.

In general, it was found that the spin-spin coupling constants J became smaller as the number of chemical bonds between the interacting nuclei became greater. The spin-spin coupling constants were found to have characteristic values for various chemical groups that varied only slightly as neighboring groups were changed. The coupling

constants of the fluorine nuclei and the proton of the CF_2H group have values within the limits $57.2 \geq J_{\text{FH}} \geq 52.4 \text{ c/s}$, and the CH_2F group has a coupling constant with values within the limits $47.3 \geq J_{\text{FH}} \geq 45.5 \text{ c/s}$. The coupling constant of the proton and fluorine nuclei of the CH_2 group and an adjacent CF_3 group has values within the limits $10.5 \geq J_{\text{FH}} \geq 9.2 \text{ c/s}$. It was found that the value of the coupling constant of a CF_3 group and an adjacent CF_2 group was $J_{\text{FF}} \leq 0.4 \text{ c/s}$.

The spectrum of the CF_2H group in the $\text{CF}_2\text{H}-\text{CF}_2-\text{CFHBr}$ sample exhibited certain features which indicated that hindered rotation occurred about the carbon-carbon bond between the CF_2H group and the CF_2 group. The F^{19} resonance of the CF_2H group in the $\text{CF}_2\text{H}-\text{CF}_2-\text{CFHBr}$ sample was measured at several temperatures between -96°C . and $+100^\circ\text{C}$. The relative chemical shift of the two rotational isomers of the molecule decreased as the temperature increased, and the various spin-spin coupling constants changed with temperature changes.

Microfilm \$2.50; Xerox \$8.60. 187 pages.

A STUDY OF COLOR CENTERS PRODUCED IN QUARTZ BY X-RAYS

(L. C. Card No. Mic 60-653)

Guy Forman, Ph.D.
University of Kentucky, 1950

The research reported here was carried out in order to investigate the following points: (a) the optical transmission, for wave-lengths from 4000A to 8000A, of quartz crystal sections before and after irradiation with known amounts of x-rays, (b) the optical transmission when the quartz sections have reached color saturation, (c) reproducibility of the optical transmission values at a color saturation after removal of the color by heating and recoloration by re-irradiating, (d) effect of radiation other than x-rays on the color saturation of quartz, (e) the effect, if any, of the type of heat treatment used in removing the color, on the rate at which quartz is recolored on being again irradiated with x-rays.

It is clearly indicated that there exist values of optical transmission, for the quartz sections used, generated as described earlier. These values are different for different wave-lengths, varying from approximately twenty-five per cent at 4000A to sixty-five per cent at 8000A. The decrease in optical transmission in this range of wave-lengths is continuous; therefore, no absorption maximum occurs in this region of the spectrum. The color saturation may be altered by changing the energy distribution of the x-ray's producing the color change. This was observed when the voltage across the x-ray tube was lowered to thirty PKV. If the intensity of the x-ray is altered by changing only the current through the tube, which does not change the energy distribution of the beam, the color saturation is practically unchanged. For the crystal sections colored by x-rays alone, the optical transmission at saturation does not vary from the crystal section to another by more than experimental error. The heat-treatment used in removing the color from quartz does not affect the value of the optical transmission at color saturation. This is substantiated by the fact that crystal sections reached the

same transmission limit after successive irradiation cycles, even though different heat-treatments were used to remove the color between irradiation cycles. Thus it appears that the value of the color saturation is a function of the quartz structure and the energy distribution of the radiation used in producing this color.

It was observed that in every case the rate of coloration was greater after the sections had been cleared and re-irradiated than when the color was being produced for the first time. Color centers must be present in the quartz if it is to be sensitized by baking. This is indicated by the fact that the original rate of coloration for a crystal section that was baked before the first irradiation cycle was the same magnitude as that of the other crystal sections. Crystal sections that were subjected to identical heat-treatments, when color centers were present, give the same rate of coloration on being re-irradiated.

If the baking is restricted to an amount barely sufficient to remove the coloration, as determined by a return to the original transmissions, then the rate of coloration follows the same curve on successive irradiation cycles. If the crystal section is baked for a longer period of time than that stated above, then the rate of coloration decreases and approaches that of fresh quartz. The sensitizing of quartz is completely governed by the immediately preceding heat-treatment employed in removing the color centers. No "memory" of previous heat-treatments appears to be present.

Insufficient data have been secured to establish definitely the effect of the radiation of the experimental pile on quartz; however, from the results obtained on a single crystal section certain observations may be considered. After the crystal section had been in the pile for a period of one week, it was colored more by irradiation with x-rays. There appears to be a residual effect produced by the irradiation in the pile. The values of transmission observed at color saturation were not the same on successive colorations and the optical transmissions was lower than any obtained for the other quartz sections. The values of the optical transmission, at saturation, changed each time the section was decolorized and re-irradiated. Successive irradiation cycles and decolorizations caused the values of the optical transmission, at saturation, to approach those of the other quartz sections.

Microfilm \$2.50; Xerox \$4.20. 78 pages.

FREQUENCY DEPENDENCE OF THE SURFACE RESISTANCE OF SUPERCONDUCTING TIN IN THE MILLIMETER WAVELENGTH REGION

(L. C. Card No. Mic 60-35)

Raymond Kaplan, Ph.D.
Columbia University, 1959

The ratio of superconducting to normal surface resistance of polycrystalline tin has been measured as a function of frequency and temperature between 17 kMc/sec and 77 kMc/sec from 1.5°K to 3.0°K. A theoretical formula for this ratio has been obtained by Serber (unpublished) on the basis of the London two fluid model of superconductivity and the Reuter-Sondheimer theory of the anomalous skin effect. If the electronic mean free path is

chosen as $(8 \pm 2) \times 10^{-3}$ cm and the Fermi velocity as $(1.3 \pm 0.2) \times 10^7$ cm/sec, then the data and the formula are in good agreement. This agreement is not sensibly affected by any reasonable choice of the superconducting penetration depth. Microfilm \$2.50; Xerox \$3.60. 61 pages.

THE TWO HALL COEFFICIENTS IN PSEUDO-NICKEL ALLOYS

(L. C. Card No. Mic 60-589)

Edward Richard Sanford, Ph.D.

Iowa State University of Science and Technology, 1959

Supervisors: Emerson M. Pugh

Donald E. Hudson

The transverse electric potential in perpendicular electric and magnetic fields has been determined as a function of magnetic induction and temperature for three ferromagnetic "pseudo-nickel" alloys. From these measurements at fields above magnetic saturation the ordinary and extraordinary Hall coefficients were determined. The pseudo nickels are alloys of copper and iron in nickel, with compositions such that the electron-atom ratio and crystal structure are those of nickel, having saturation magnetizations equal to that of nickel. Hence, it was expected that the only important effect as the composition changed from that of nickel would be in the scattering mechanism. Measurements were made at 20, 77 and 300 K, in fields up to a maximum of 22 kilogauss.

It was determined that the Hall behavior of the pseudo nickels was unlike that of nickel, but similar to that of the palladium-nickel alloys. As the content of iron and copper increased the temperature dependence and the magnitude of the ordinary Hall coefficient approached those of the copper-nickel and cobalt-nickel alloys, as had been expected.

The simple two-band model, which successfully accounted for the behavior of the ordinary coefficient in copper-nickel and other alloy systems, cannot explain the ordinary effect in all of the pseudo nickels. In all of the alloys tested the value of the effective number of conduction electrons per atom exceeded one-half of the number of 4s electrons per atom and, for alloys approaching pure nickel in composition, exceeded the number itself. Hence, within the context of simple band theories, a four-band model with high-mobility 3d-band holes is required to explain the ordinary coefficient.

The temperature dependence of the ordinary coefficient was found to follow that predicted by the band theory, primarily in that the magnitude of the coefficient decreases with increasing temperature. Although the extraordinary coefficient seemed to follow a power-law dependence upon resistivity over most of the range of temperature examined, this dependence did not agree with any existing theory of the extraordinary effect.

The results of this investigation indicate that the magnitude and temperature dependence of the ordinary Hall coefficient are critically dependent upon the scattering mechanisms operative, and that simple band models cannot explain the Hall behavior of the subject alloys in any but a very qualitative manner.

Microfilm \$2.50; Xerox \$3.00. 59 pages.

PHYSIOLOGY

DIETARY CHOLESTEROL ON FREE AND BOUND CHOLESTEROL AND LIPID-PHOSPHORUS CONTENT OF RABBIT AND RAT AORTA, HEART MUSCLE, PLASMA AND ADRENAL.

(L. C. Card No. Mic 60-728)

Jay Winfred Constantine, Ph.D.

The Ohio State University, 1959

Young male albino rabbits and rats of the New Zealand and Wistar strains, respectively, were each divided into three experimental groups based upon addition of a supplement to the regular diet: (A) normal - no supplement, (D) 1% cholesterol in 10% ether, and (E) 10% ether. For the latter two groups the indicated supplements were thoroughly mixed with the stock rations, and the ether was immediately evaporated. Rabbits were maintained on the indicated regimen for 9 to 21 weeks, and rats for 8 to 9 weeks. All animals were starved 19 to 21 hours prior to sacrifice. Cholesterol was determined by the Sperry-Schonheimer method; lipid-phosphorus by the Youngburg

and Youngburg modification of the Fiske and SubbaRow method. The following data were obtained from a comparison of the indicated groups. For a given tissue all data are presented as the percent difference between free and esterified cholesterol, lipid-phosphorus, and C/P ratio, respectively. Statistically significant (Probability < 0.05) values are underlined.

Groups E-A, rabbits: aorta 14, -89, 0, 31; heart muscle 8, -67, -12, 18; plasma 6, 53, -2, 47; adrenal 29, 54, 13, 44. Rats: aorta 9, -57, -50, 89; heart muscle 0, 0, -25, 47; plasma -67, 8, -23, 46; adrenal -38, -7, -29, 36.

Groups D-E, rabbits: aorta 533, 20,900, 67, 572; heart muscle 86, 2,600, -14, 294; plasma 2,002, 1,251, 633, 192; adrenal 451, 16, -23, 63. Rats: aorta -4, -33, 0, -4; heart muscle 0, -100, -17, 1; plasma -18, 0, 12, -17; adrenal -9, 24, 17, 0.

Adrenal weight/body weight and heart weight/body weight ratios were determined, and in that order the following percent differences were obtained: Groups E-A, rabbits: -16, 29. Rats: 17, 7. Groups D-E, rabbits: 221, -12. Rats: -12, 3. Microfilm \$2.50; Xerox \$4.20. 79 pages.

VARIATIONS IN THE PHYSIOLOGICAL RESPONSE TO STRESS IN DWARF AND NORMAL BEEF ANIMALS

(L. C. Card No. Mic 59-6376)

Charles William Foley, Ph.D.
University of Missouri, 1959

Supervisor: John F. Lasley

A study was made of the physiological response to stress as induced by insulin injections in dwarf, known carriers of the dwarf gene and homozygous normal beef cattle. The response to stress was determined by measuring changes in the blood glucose level by two different methods and changes in different kinds and numbers of leucocytes in the blood stream after the hormone was administered. Two different dosages of insulin were used--a high dosage level at the rate of 0.8 units per kilogram of body weight followed within twenty-four hours by a lower dosage level of 0.3 units in the same animal. The glucose studies showed rather clearly that the dwarfs were much more sensitive to insulin than were the normal animals with the known carriers intermediate in this respect. Increases in neutrophil numbers and decreases in eosinophil numbers over a period of 12 hours following insulin injections showed the homozygous normal animals responded more readily and to a greater extent than the dwarfs with the known carriers of the dwarf gene again being intermediate between the other two genotypes on a group basis. The same results were obtained at both a high and a low level of insulin. These results suggest that the gene responsible for "snorter" dwarfism is in some manner directly or indirectly concerned with carbohydrate metabolism and in the ability of the dwarf to cope with an insulin induced stress. Possibly this is due to the improper balance between the hormones secreted by the pituitary and those secreted by the adrenal cortex and may involve ACTH or Growth hormone or both.

Microfilm \$2.50; Xerox \$7.20. 152 pages.

WATER BALANCE IN THE TURTLE IN RESPONSE TO SEASON AND HYPOTHERMIA

(L. C. Card No. Mic 60-334)

J. Walter Grundhauser, Ph.D.
St. Louis University, 1959

The freshwater turtle, *Chrysemys picta* Schneider, was used throughout the entire series of experimental studies. Five groups of experimental and control animals (males) were received at intervals during the year which can roughly be described as late summer, fall, winter, spring and early summer. The experimental animals were subjected to low temperatures (body temperature 1-4°C) for periods of time ranging from four to six weeks and were not fed. The controls were maintained in a terraqueous tank at room temperature and fed horsemeat. Subsequently the turtles were sacrificed and samples of blood and urine obtained. Hematocrit ratios, plasma specific gravities, plasma pHs, plasma freezing point depressions and urine freezing point depressions were then ascertained.

Analysis of the physical measurements made yielded the following information:

1. There was a tendency toward hemoconcentration in turtles subjected to hypothermia as reflected in the hematocrit ratio and plasma specific gravity.
2. Turtles subjected to cold torpor displayed increased freezing point depression of both blood plasma and urine.
3. The plasma hydrogen ion concentrations of hypothermic turtles tended to be lower than those of the controls during the warmer months and higher during the cold months of the year.
4. Control turtles maintained at room temperature throughout the year displayed hemodilution during the warmer portions of the year and hemoconcentration during the colder portions.
5. The plasma and urine Δ s of control animals held at room temperature throughout the year tended to be larger during the late summer and fall and smaller during the remainder of the year.
6. The plasma hydrogen ion concentration of the controls tended to be low in winter reaching a peak in early summer and then tapering off during late summer and fall, thus paralleling the activity of the organism.

Interpretive analysis of the above facts seem to support the following conclusions:

1. Some of the water removed from the blood of the hypothermic turtle is probably shifted into the tissues and possibly a portion excreted by the kidneys.
2. Increased plasma protein levels together with elevated plasma pH in hypothermic turtles during the colder portions of the year may favor removal of some plasma water by imbibition by plasma proteins.
3. The lowering of the freezing point of the more concentrated body fluids is probably of less import in cold exposed turtles in preventing death by freezing than the fact that there is less freezable water available.
4. The increased proportion of plasma protein in the cold exposed animals probably permits a greater degree of subcooling before injurious freezing occurs by delaying molecular motion and thus preventing the formation of ice nuclei.
5. Withdrawal of water from the blood of cold exposed animals reduces the heat transporting capacity of the blood and consequently the small amount of metabolic heat produced under such conditions is conserved by being carried to the radiating surfaces of the animal in diminished quantity.
6. Turtles undergo variations in the water and solute contents of their body fluids from season to season independent of temperature.
7. The smaller plasma Δ s of the control animals held at room temperature during the colder portions of

the year indicate that an osmotic equilibrium at a lower level of concentration supervenes in such animals and is seasonal in nature.

Microfilm \$2.50; Xerox \$5.00. 97 pages.

HOURLY VARIATIONS OF MITOTIC ACTIVITY IN THE LIVERS OF YOUNG RATS

(L. C. Card No. Mic 60-504)

Benjamin A. Jackson, Ph.D.
New York University, 1957

Adviser: C. H. Willey

The interpretation of the presence of mitoses in livers of rats treated with hepatotoxic agents entails an understanding of the variability of occurrence of mitotic activity in the normal animal. Variations of mitotic activity associated with time have been described for many different organs and tissues of laboratory animals. Such variations have not been investigated in the livers of the normal rat. Evidence of time-associated variations of mitotic activity has been presented for regenerating livers of rats (Jaffe, 1954) and for livers of young mice (Wilson, 1948). It is the purpose of this study to investigate the occurrence of mitoses in livers of young rats by taking tissue samples at intervals during a 24-hour period.

The first experiment of this study was done during the three summer months of 1954, and a second experiment was carried out in June of 1956. In the first experiment, different portions of the 24-hour period were studied in different months; but in the second experiment, the animals were sacrificed during a period of 24 consecutive hours. An examination of the cytology of the liver, including the stages of mitosis and a study of the spatial distribution of mitoses within the liver lobule, was also carried out.

Male albino rats, about four weeks old, were used in both experiments. Sherman rats were employed in the first experiment, and Wistar rats were used in the second. The rats were maintained under normal lighting conditions, controlled temperature and *ad libitum* feeding schedule. The animals were sacrificed at 2-hour intervals in groups of 5 in the first experiment, and groups of 8 in the second. Chloroform inhalation was used for killing. At autopsy, specimens from the median lobe of the liver were placed in Carnoy's fixative. Paraffin sections (6 μ in thickness in the first experiment and 10 μ in the second) were stained with Weigert's Iron Hematoxylin for mitotic counts and the study of the spatial distribution of mitoses. The cytology of the liver and the stages of mitosis were studied in sections stained with Heidenhain's Iron Hematoxylin. Mitotic activity was determined by counting hepatic mitoses in 250 oil immersion fields (970X). In the second experiment, cell counts were made so that the numbers of mitoses could be related to the numbers of cells examined. In this experiment the stage of mitosis was also recorded for each mitosis counted.

From the study of the mitotic stages, criteria were adopted for identifying the phases of mitosis. In regard to the spatial distribution of mitoses, there seemed to be more mitoses in the proximity of portal areas than near

central veins. A similar observation was made by McKellar (1949) in livers of young rats, and by Harkness (1952) in regenerating livers of rats. Because of the variability of lobular structure, in the livers of young rats (presence of compound lobules, McKellar, 1949) and the distortion of lobular structure due to sectioning, no definite conclusions were drawn.

In both experiments time-associated variations of mitotic activity were found. The greatest numbers of mitoses were found at 8:00 a.m. The occurrence of lowest mitotic activity at 12:00 noon in the first experiment was not observed in the subsequent experiment. In the latter investigation, lowest mitotic activity was found between 6:00 p.m. and 6:00 a.m. In the second experiment, the relative frequencies of the stages of mitosis were found to be similar for the different time intervals. The results of these experiments are comparable, in general, to those of Jaffe (1954) and Wilson (1948) who, also, found highest mitotic activity during the day.

The cell counts were used to estimate cell size by calculating the reciprocal of the mean number of cells per field. A rise and fall in cell size estimated in this manner was found to occur during the 24-hour period studied. Maximal cell size occurred at 6:00 a.m., and minimal cell size at 8:00 p.m. Cell size decreased during the time of high mitotic activity and increased during the time of low mitotic activity. In the regenerating livers of rats, Brues, Drury and Brues (1936), and Stowell (1948) also observed a relation between cell size and mitotic activity.

The percentages of binucleate cells were estimated from cell counts. These values also varied with the time of day. Binucleate cells were fewer in number during low mitotic activity. A reduction in the number of binucleate cells accompanying active mitosis has been reported by Sulkin (1943).

Time-associated variations of mitotic activity were examined in relation to some of the circumstances which surround the process of cell division. It is suggested that time-associated variations of mitotic activity may be correlated with time-associated variations of these circumstances. Microfilm \$2.50; Xerox \$5.20. 104 pages.

A RHINENCEPHALIC CENTER AFFECTING FOOD INTAKE AND BODY WEIGHT IN THE CAT

(L. C. Card No. Mic 60-446)

Peter J. Morgane, Ph.D.
Northwestern University, 1959

Many investigators have reported that the primitive amygdaloid complex within the rhinencephalon is concerned with feeding behavior in man and several animal species. However, none of these studies has been quantitative in nature. It has also been reported in certain species (rat, cat, monkey, mouse, dog) that the middle hypothalamus contains a "satiety" center (removal of which causes hyperphagia and obesity), but the evidence concerning the existence of a more lateral "feeding" center (removal of which causes aphagia) is controversial in the cat. The objective of the present study was to quantitate the effects of destruction of the amygdala on food intake and body weight in cats and to explore the possibility that these effects are mediated by the middle hypothalamus.

Body weights and food intakes in the ad libitum feeding situation were regularly carried out pre- and post-operatively in 17 adult male and female cats sustaining bilateral open removal of the amygdaloid complex. The operation was followed by hyperphagia and a period of rapid weight gain in every animal. During this dynamic phase of obesity the food consumption was approximately doubled for an average period of 9 months during which the animals gained one-third of their body weight at a mean rate of 47 grams per week. This was followed by a static phase of obesity in which food intake returned to normal and body weight remained essentially constant at its elevated level. Negligible effects on food intake and body weight were seen in operated and unoperated control animals during these periods.

One of the original objectives of these experiments was to investigate Bard's hypothesis that amygdectomy converts the placidity of neodecortication to rage behavior. Of the above animals, some were neodecorticated before amygdectomy, some during the dynamic phase of obesity following amygdectomy, and some during the static phase of obesity. No changes in rage thresholds were detectable in any of the groups. Neodecortication had no effect on food intake when done alone or during the static phase of amygdalar obesity, but it increased by approximately 70% the rate of weight gain in response to amygdectomy, without correspondingly increasing food intake.

The role of the hypothalamus was explored by means of stereotaxically located lesions. Bilateral destruction of the lateral hypothalamus in 9 cats and of both lateral and ventromedial hypothalamus in 3 cats produced no changes in food intake or body weight. But bilateral destruction of the ventromedial nuclei alone in 1 cat induced hyperphagia and marked weight gain; subsequent destruction of the amygdala and lateral hypothalamus in this animal induced a second phase of hyperphagia and weight gain after this animal was in the static phase of hypothalamic obesity. In 8 cats simultaneous destruction of both lateral and ventromedial hypothalamic areas together with amygdectomy produced the same hyperphagia and total weight as amygdectomy alone, but the rate of weight gain was nearly 3 times greater. Part of this faster weight gain may have been due to the less traumatic stereotaxic procedures.

It is concluded from the above results that in the cat the amygdala certainly and the ventromedial nuclei probably function as "satiety" centers, the effect of destruction of both together being greater than for either alone. No evidence was found to indicate that the lateral hypothalamus functions as a "feeding" center, or is even necessary for the operation of the 2 "satiety" centers.

Microfilm \$2.50; Xerox \$4.80. 95 pages.

CIRCADIAN ACTIVITY RHYTHMS IN COCKROACHES

(L. C. Card No. Mic 59-5216)

Shepherd K. Roberts, Ph.D.
Princeton University, 1959

Continuous recordings of the locomotor activity of individuals of several species of cockroach (*Leucophaea maderae*, *Byrsotria fumigata*, and *Periplaneta americana*) were obtained under various environmental conditions in

the laboratory. Under conditions constant with respect to light and temperature an overt activity rhythm persists indefinitely. The period of an individual's rhythm is given by the average time between successive onsets of activity; each animal displaying its own characteristic period within the range of about 23 1/2 to 24 1/2 hours.

Although several instances of apparent spontaneous period changes have been observed under constant conditions, the periods for the majority of animals remain fixed. However, period changes can be induced by a transient alteration of the environmental conditions such that the period of a rhythm in constant conditions prior to the alteration differs significantly from the period subsequently recorded under identically constant conditions. Thus the period of the activity rhythm reflects a labile endogenous system.

As is the case with most other nocturnal organisms, the period of the cockroach rhythm is lengthened in constant light by as much as 60 minutes. This treatment also produces an hitherto unnoticed change in the pattern of activity which is characterized by a strong, persistently recurring peak of ancillary activity about 10 hours out of phase with the normal onset.

The period of an individual's rhythm is relatively insensitive to prolonged temperature changes within the range of 20°C to 30°C. The shortening of the period at the higher temperature represents at most a Q_{10} of about 1.04.

Despite the relative temperature insensitivity of the period of the roach rhythm, the phase may be shifted to a new steady-state by a step-up temperature pulse. Phase shifts up to 12 hours have been elicited by a 12°C step-up in temperature, whereas the maximum shift for a 12 hour light signal (200 f.c.) is only two to three hours. An analysis has been made of the pattern of phase shifting of the roach rhythm in response to a 12 hour light signal. It was established that the light to dark transition ("dusk") acts as the phase-give under these conditions. When "dusk" occurs at the same time as the onset of activity there is no resulting phase shift. When the "dusk" signal occurs up to 12 hours following the onset of activity a delay phase shift is elicited with a transient lengthening of the period. When the phase-giving signal falls up to 12 hours prior to the onset of activity an advance phase shift occurs with a transient shortening of the period.

Phase shifts in response to light signals are not impaired by surgical removal of the ocelli, however covering both the ocelli and the compound eyes with opaque wax renders the roach insensitive to phase-shifting light signals. When the compound eyes are covered and the ocelli left uncovered, the phase of the rhythm can not be shifted. Thus, it is clear that the compound eyes and not the ocelli are the organs through which light signals mediate the phase of the rhythm.

An attempt has been made to confirm work by another investigator¹ which suggested that the center of the endogenous rhythmicity in the cockroach resided within the neurosecretory cells of the sub-esophageal ganglion. The repeat of this work, however, failed to confirm this hypothesis. Microfilm \$2.50; Xerox \$6.00. 124 pages.

1. Harker, J. E., 1956, *J. Exp. Biol.* 33, 224.

THE AXENIC CULTURE OF PARAMECIUM CAUDATUM: NUTRITIONAL REQUIREMENTS AND METABOLISM.

(L. C. Card No. Mic 60-524)

Francis J. Sterbenz, Ph.D.
New York University, 1957

Adviser: Richard P. Hall

A medium is described for the axenic culture of *Paramecium caudatum* which is chemically defined except for one constituent - a yeast autolysate fraction. The components of this medium include an amino acid mixture, a mixture of purines and pyrimidines, a steroid, a carbon source an inorganic salt mixture and a yeast autolysate fraction.

The methods for preparing and fractionating the yeast autolysate are described. Evidence is presented that commercial yeast extract or autolysate contains only one of the essential fractions obtainable from yeast. It is probable that upon completion of the analyses of these fractions new information regarding nutrition in higher forms will be attained.

An exogenous source of purine and pyrimidine was found to be essential for growth. In the absence of other purines, guanylic acid could fully satisfy this requirement. Hypoxanthine and adenylic acid were capable of supporting limited growth but xanthine could not. In the absence of other pyrimidines cytidylic acid, uracil or uridylic acid could fully satisfy this requirement. Thymine would also support growth, but at a much lower level.

In ether extracted media no growth occurred in the absence of steroid. The requirement for steroid could be satisfied by either stigmasterol or sitosterol but not by calciferol. In cultures treated with oleic acid or Tween 80 the paramecia were double their usual size and exhibited a depressed division rate. The final number of generations in a culture was unchanged. The ease with which these large ciliates would disintegrate proved disadvantageous in culture maintenance.

Growth failed in the absence of an organic nitrogen source. This requirement could be met with any of the following: proteose peptone, Bacto-peptone, casein, casein hydrolysate, bacto casamino acids or a mixture of amino acids.

In addition to a mixture of nine water soluble vitamins and choline which were added routinely thioctic acid was found to be required for *P. caudatum* when the ciliate was cultured in a medium containing the acetone fractions obtained after the yeast autolysate preparation was dialyzed. This is the second case in which a ciliate has been found to need exogenous thioctic acid.

The addition of sucrose, maltose, lactose, galactose, dextrine or soluble starch to the media improved the final yield of organism by about one generation.

This investigation proposed to explore the suitability of axenic culture methods for supplying ciliates in quantities adequate for the investigation of some aspects of metabolism. It was found that consistent characteristics of growth could be obtained in flask cultures by inoculating 200 log phase organisms per ml. Inoculation of fewer organisms failed to produce ciliates of the same size and also failed to yield the same dry weight of organism per ml. of culture.

In a non-nutrient medium *P. caudatum* respired at an almost linear rate over a one hour period. At 26°C. the

Q_{O_2} value was 22.6 and at 37°C. the Q_{O_2} was 47.5. The activity of succinic dehydrogenase, determined using homogenates of the ciliates, was 2.4 μ l O_2 /mg. dry wt./hr. and that of α -glycerophosphate was 0.9 μ l O_2 /mg. dry wt./hr. The activity of endogenous respiration and of succinic dehydrogenase obtained using ordinary manometric techniques compares favorably with that reported by other investigators using more laborious methods. This indicates the suitability of these axenic culture methods for investigating phases of cellular metabolism.

Microfilm \$2.50; Xerox \$3.80. 66 pages.

PULMONARY AND CARDIOVASCULAR RESPONSE MECHANISMS IN DOGS DURING INHALATION OF LOW CONCENTRATIONS OF CARBON MONOXIDE

(L. C. Card No. Mic 60-800)

Frederick Clayton Thiede, Ph.D.
The Ohio State University, 1959

In the past, there has been much controversy over physiological mechanisms involved in compensatory responses of the mammalian respiratory and cardiovascular systems to inhalation of carbon monoxide. In particular, sub-lethal studies of carbon monoxide poisoning have raised profound questions about whether respiratory and circulatory function is actually stimulated or depressed as a result of formation of considerable quantities of carboxyhemoglobin in the blood. Moreover, the physiological mechanisms involved in these responses need much elucidation concerning their character and mode of action. This investigation is an attempt, first of all, to establish that stimulation of respiration and cardiovascular function does occur and, secondly, to measure the three chemical factors of the blood and body fluids (P_{CO_2} , P_{O_2} , pH) which are known to influence these responses, and to see whether alteration of the chemical factors can account for the observed phenomena.

Arterial and venous blood samples were analyzed for CO_2 and O_2 tension, CO_2 and O_2 content, O_2 capacity, and pH, and recordings were made of total and alveolar ventilation, tidal volume, respiratory rate, cardiac output, heart rate, arterial and vena cava blood pressure, and metabolic rate on fifteen experimental and six control dogs anesthetized with sodium pentobarbital. The blood samples were taken from the experimental dogs in the steady state both before and after administration of 0.15 per cent carbon monoxide in room air. The post-CO samples were drawn approximately ninety minutes, on the average, after carbon monoxide breathing began when the respiratory and cardiovascular steady state had been re-established following the changes which occurred as a result of the carbon monoxide inhalation. Respiratory and cardiovascular measurements were monitored at frequent intervals throughout the experiment. Control dogs were treated in the same manner as the experimental animals except that room air was administered in lieu of the carbon monoxide-air mixture.

Results showed a 65 per cent increase in total ventilation and a 38 per cent increase in cardiac output. No significant changes were noted in arterial blood pressure, heart rate, or metabolic rate. The arterial P_{O_2} , pH, and P_{CO_2} remained essentially unchanged, and venous pH and

P_{CO_2} were significantly unaltered. Venous P_{O_2} , however, was markedly diminished, suggesting local capillary bed O_2 -lack.

The blood chemistry results afforded no explanation for the increased respiration on the basis of the classical arterial chemical factor theories. Ventilatory changes were, therefore, explained on the basis of an altered chemical environment of the respiratory center which was not reflected in the arterial blood chemical factors. O_2 -lack in the center caused moderate lactic acid build-up which

raised the H-ion concentration in the center, resulting in hyperventilation. This hyperpnea apparently maintained the arterial P_{CO_2} and pH at near normal levels.

The increase in cardiac output was accomplished through an increase in stroke volume only and was clearly due to an augmentation of venous return, which in turn was due to the progressive capillary bed dilatation in response to local O_2 -lack in all the tissues in general.

Microfilm \$2.50; Xerox \$6.00. 121 pages.

POLITICAL SCIENCE

POLITICAL SCIENCE, GENERAL

ORGANIZATION IN THE COMMUNIST PARTY, U.S.A., 1931-1938.

(L. C. Card No. Mic 60-417)

Robert Jay Alperin, Ph.D.
Northwestern University, 1959

Chairman: Richard C. Snyder

The primary goal was to describe the organizational practices with respect to the typical problems of daily operation. The description emphasized: attention to development and change, placing particular aspects in terms of their function in the organization as a whole, and relating developments in one category to those in another. Other objectives were to test a few hypotheses (derived mainly from Almond's previous study) and to provide a set of propositions and suggestions likely relevant to the general study of organization and politics. Mostly, the reference point of the research is the Party as a whole; the material, even if taken from the experience of a particular unit, is assumed to be applicable, for the most part, to any unit.

The Party portrait was drawn from two primary sources, *Party Organizer* and *The Communist*. Both were Party publications; the former, the major source, was an internal organ to instruct and improve the membership; the latter periodical, a magazine "of the theory and practice of Marxism-Leninism," was available by subscription. The internal journal tended to print detailed accounts of activities, while the publicly circulated one was mainly useful for its general organizational analyses.

Opening chapters present the author's orientation, place the organization within the contexts both of its history and those of labor and politics generally, note the organization's formal structure and principles, and trace trends in the composition of its membership. "The Lower Organizations," covers the practices and problems of metropolitan area territorial units as well as those of shop, industrial, and rural units. In "The Process of Recruiting" some indications of Party activity in the environment are gleaned, but only from the viewpoint of their relevance to recruiting. The chapter briefly treats the problems of disaffiliation. The *Daily Worker*, shop papers, mass literature and leaflets are among the "Channels of Communication." While the focus of most of the data was the lower units, the scanty material available regarding internal operations at the national, district, and section levels is presented in "The Party Committees." A final descriptive chapter discusses problems such as: the selection and use of personnel with respect to functionary roles, the protection of the Party from police and vigilante interference, and finance.

The data strongly indicates that in the first years of the Great Depression the Party was unprepared organizationally either to systematically agitate and propagandize

for its solution, or to effectively assimilate its recruits. A lack of planning characterized many phases of Party work. As the decade developed the organizational apparatus greatly improved: a system of classes and schools was developed, the high turnover of membership was greatly reduced, the lower units displayed more initiative, financial affairs moved from the category of dribble and chaos to that of budgeting, and the publication and distribution of Party literature became more planned and greatly expanded. The composition of the membership was altered greatly as greater proportions of the native-born and of women entered. Throughout the period a major weakness was the absence of attention to the rural areas.

Much member behavior was consistent with Almond's hypotheses regarding worker perceptions of the Party. His hypothesis on the primacy of agitational over doctrinal appeals in recruitment appeared valid when modified to include the importance of Party activity perceived as furthering goals held important by potential recruits (e.g., organization and leadership in unions). Arguments against the views that Marxism was unimportant to Party decision-making, or was abandoned by it noted theory's function in ordering perception, and criticized tendencies to view theory statically, or removed from the specific conditions of its creation and application.

Microfilm \$6.75; Xerox \$23.85. 530 pages.

PIERRE MENDES-FRANCE: A STUDY OF POLITICAL IDEAS IN ACTION.

(L. C. Card No. Mic 60-297)

William George Andrews, Ph.D.
Cornell University, 1959

The single striking exception to the humdrum monotony of *immobiliste* governments in the Fourth French Republic was the ministry of Pierre Mendes-France in 1954-1955. This government, more than any other of the Fourth Republic fired the imagination of Frenchmen by its dynamism, its determinism to undertake tasks that had been evaded by previous governments. Yet, the Mendes-France government survived scarcely longer than the average period for a government under the Fourth Republic and failed to accomplish many of the tasks it had set for itself.

This thesis has been written in the belief that an evaluation of the political ideas of Mendes-France and of the performance of his government can shed light on the fundamental problems of French democracy.

An analysis of the ideas expressed by Mendes-France on principles of democratic government discloses that he has consistently and unswervingly supported parliamentary democracy and that he has believed that the reforms necessary to make democracy a viable force in France must be made in the spirit and attitudes of governed and governors rather than in the structure of government. He has an

almost naively-democratic faith in the certainty that the will of the people will be wise if only the mechanisms through which it is transmitted to the governmental leaders do not distort it.

The government headed by Pierre Mendes-France was most successful in settling the Indochinese war and the Tunisian disorders because these situations were most "ripe" for solution and because the government most consistently adhered to the forceful, dynamic approach that set it apart from its predecessors. Its policies in Indochina and Tunisia were realistic. The government was less successful in Morocco and in the area of economic policy because it did not energetically strive to find new formulas, dramatic new departures. It was successful in ending the quarrel over the European Defense Community and in finding a suitable, acceptable new formula in the Western European Union on which western defense arrangements have rested since then. But tactical errors in handling this difficult problem eventually led to the overthrow of the government and thus its ultimate failure.

The failure of the Mendes-France attempt to adapt French democracy to the conditions of modern society in such areas as colonial disengagement and economic structure resulted in the eventual collapse of the Fourth Republic. The ideas and style of action of Mendes-France were appropriate to a solution of the outstanding French problems, but he lacked important abilities as a political organizer and tactician that prevented his action in the government from conforming to the almost painful consistency of his political ideas and which cut short the life of his government; and, to a certain extent, handicapped his efforts to return to office.

Microfilm \$7.70; Xerox \$27.45. 606 pages.

**REASON AND THE POLITICAL PROCESS:
A CRITIQUE OF THE THEORY OF
LIBERAL-DEMOCRACY FROM A FREUDIAN
POINT OF VIEW.**

(L. C. Card No. Mic 60-18)

Donald S. McIntosh, Ph.D.
Columbia University, 1959

The dissertation is a critique of the concept of "reason" employed by the tradition of political thought associated with the evolution of the modern liberal-democratic state. The critique is based largely on ideas developed by psychoanalytic thinkers, principally Freud and contemporary orthodox theorists such as Heinz Hartmann and David Rapaport.

Since a major tenet of the Western tradition is that the state is or ought to be a rational order, the position adopted on the nature of reason has large consequences for political theory. "Reason" may designate either a function or a process. Following modern analytic and sociological usage, a functional definition is advanced: reason is the function of suiting means to ends, regardless of the process involved. Conscious, scientifically correct thought is one of many processes which may or may not perform a rational function.

The liberal-democratic tradition has used "reason" in a narrower sense than was common previously. According

to this view, a goal can be pursued rationally or irrationally, but the validity of a goal is not rationally discriminable except with regard to practicality and consistency with other goals. A goal which is attainable and whose attainment is consistent with other more important goals can neither be validated nor invalidated by reason. Political theory nevertheless has a normative status; the institutions of liberalism and later of liberal-democracy are defended because they maximize the possibility of goal satisfaction by the members of society and hence constitute the most rational possible political order. This description of the traditional liberal-democratic view of "reason" and its function in political theory is supported by brief analyses of Hobbes, Locke, Hume, J. S. Mill, T. H. Green, L. T. Hobhouse, and R. I. MacIver. It is argued that the fundamental philosophical presuppositions of the tradition lead to this view.

Psychoanalytic theory has sharply critical implications for this viewpoint. The goals which men pursue are not only ends but also means to instinctual satisfaction. The innate instinctual constitution does not include purposive behavior; adaption can be achieved, however, only through the development and organization, in the psychic system, of drives. Drives involve purposive behavior towards specific goals. A characteristic of pathological behavior is that drive objects cannot provide adequate instinctual satisfaction, even if achieved. Hence the behavior of an individual may be irrational even if the goals of his purposive activity are attainable and consistent with each other.

This raises the possibility that a political order which is rational in the sense employed by the liberal democrats, in that it satisfies the wants of men, may be irrational in the sense that it does not satisfy their needs, or may even encourage the formation of inappropriate wants. Although the evidence is not fully conclusive, an examination of some studies on irrational behavior in the political and social sphere, including the literature on the "authoritarian" personality, suggests that the problem of achieving a rational political and social order is far deeper than has been thought, and that as our society becomes more and more "rationalized" in the sense used by the liberal-democratic tradition and such sociologists as Max Weber, it may become less and less rational in the fuller sense. To deal with this problem, a thoroughgoing reconstruction of the traditional theory of liberal democracy is required.

Microfilm \$2.95; Xerox \$10.15. 225 pages.

**THE UNION NATIONALE PARTY: A STUDY OF
NATIONALISM AND INDUSTRIALISM IN QUEBEC.**

(L. C. Card No. Mic 60-28)

Herbert Furlong Quinn, Ph.D.
Columbia University, 1959

This is a study of parties and politics in the province of Quebec between 1920 and 1956. That province has three basic characteristics which differentiate it from other areas on the North American continent: the people of Quebec constitute a minority cultural group whose main pre-occupation has always been the struggle against assimilation by the dominant English group in Canada; the way of

thinking of the French-Canadian and his scale of values have been moulded by the social philosophy of Roman Catholicism; although Quebec has democratic institutions, the people of that province lack democratic convictions and have little real understanding of parliamentary government.

Around the beginning of the first World War the Liberal party, which had controlled the provincial administration since 1897, began to promote the industrialization of the province by offering certain inducements to British and American capitalists to invest in Quebec. As a result of these policies, by the early nineteen-thirties the province had been transformed from a rural and agrarian society into an urban and industrial one. Industrialization altered considerably the social and economic structure of Quebec, and presented a serious challenge to the traditional way of life and values of the French-Canadian.

In reaction to the challenge of industrialism and the dominant role played by foreign capital in the economy of the province, nationalist and anti-English sentiments spread throughout the province, and in 1935 a new nationalist party was formed called the Union Nationale. The Union Nationale's programme called for the defense of the traditional cultural values of the French-Canadian, and the introduction of economic and social reforms based on the papal encyclicals. The new party drove the Liberals from office in the election of 1936.

Once the Union Nationale was in power it quickly forgot its programme of economic and social reform, and continued the old Liberal policy of collaboration with foreign capital. Although the party was defeated in the election of 1939, it returned to power in 1944, and won the subsequent elections of 1948, 1952 and 1956. The second Union Nationale administration was characterized by a further rightward trend in economic policy, a tightening of the ties with the foreign capitalists, and the introduction of restrictive labour legislation to curb the activities of the trade unions.

The ability of a conservative and anti-labour party like the Union Nationale to retain the support of a majority of the Quebec electorate, including the working class, was due to several factors. From 1939 onward the party was the uncompromising champion of the French-Canadian point of view on three issues of crucial importance to that group: the Union Nationale opposed participation in the war of 1939; it fought the federal government's policy of centralization of power at the expense of the provinces; it embarked on an anti-Communist crusade. An additional reason for the Union Nationale's electoral victories was that its control over the administration enabled it to spend huge sums of government money for partisan purposes.

Three main conclusions can be drawn from this study: (a) where an ethnic minority is engaged in a struggle for cultural survival, that struggle becomes the dominant issue in politics, and purely economic issues tend to be pushed into the background; (b) when economic unrest arises in a strongly Roman Catholic society proposals for reform are likely to be based on the principles of social Catholicism rather than on those of social democracy; (c) in a society where democratic institutions are not accompanied by democratic convictions, a party once in power has means of perpetuating its control over the government and becomes less dependent on the financial support of business interests.

Microfilm \$3.60; Xerox \$12.60. 280 pages.

LABOR POLITICAL ACTION AT MID-TWENTIETH CENTURY: A CASE STUDY OF THE CIO PAC CAMPAIGN OF 1944 AND THE TEXTILE WORKERS UNION OF AMERICA.
(VOLUMES I AND II).

(L. C. Card No. Mic 60-790)

Martha Lee Saenger, Ph.D.
The Ohio State University, 1959

The CIO Political Action Committee campaign of 1944 typifies a phenomenon which has been a factor in every recent national election. In 1944 criticisms included allegations that PAC was "Communitic" in inspiration and direction, but in every campaign union-sponsored activity has evoked demands for regulation--even prohibition--on grounds that it is contrary to sound public policy and a threat to the American Way.

The research objective was threefold: to document the 1944 story of PAC as a campaign participant and issue; to determine the ideological and/or practical motivation behind it; and to evaluate PAC activity and impact as a guide to the formulation of public policy in this field.

Preliminary research confirmed an assumption that a plethora of forces was represented in the complex of PAC-cooperating affiliates of the Congress of Industrial Organizations. Hence a case study approach was indicated, and, given the insufficiency of contemporary evidence as a conclusive key to motivation, resort to historical method. The Textile Workers Union of America was chosen as a case study subject. Research was undertaken, first, to verify the significance of a "TWUA factor" in PAC; then, to ascertain TWUA's traditional orientation, on substantive and procedural political policy, as well as that of outstanding personalities prominently identified with it and with PAC, and, concomitantly, of important organizational antecedents and individual mentors singularly situated to influence the TWUA and CIO PAC character. Especial attention was paid to the relationship of the Communist party line on selected issues to union policy and that of CIO bodies in which TWUA personalities held positions of leadership.

The research span covered approximately thirty years of labor political history, through 1948. Principal sources consulted included journals and convention proceedings of the CIO, TWUA, the Amalgamated Clothing Workers of America, and the American Federation of Hosiery Workers; 1944 proceedings of the national Democratic convention; reports and hearings of Congressional committees; the *New York Times*; and, via interviews and correspondence, observations and recollections of labor personalities.

The dissertation encompasses extensive treatment of some of the fruits of this research. It includes narrative accounts of CIO PAC's organization, development, and exploitation as an issue; justification for and an introduction to the case study subject; a review of TWUA-endorsed political platforms; basic biographical information on individuals; description of TWUA's role in the PAC movement, nationally and in the field, and related data on character, variety, and scope of 1944 CIO PAC organization, activity and electoral potential.

Conclusions embrace motivation and observable consequences; long range implications of labor political action--irrespective of conscious intent--for selected

American institutions in the realm of government, politics, and economics; and an approach to public policy.

In important particulars immediate PAC impact was limited, negative, or negligible. In general, recognizing the 1944 phenomenon as illustrative rather than unique, it appears that at mid-twentieth century (1) greater impetus to involvement of organized labor in campaign politics flows from immediate practical considerations than from idealistic aspiration or ideological line following; (2) choice of vehicles and tactics derives from climate, circumstance, and experience; (3) the most aggressive efforts are directed toward defense of rights and standards previously won on political or economic fronts; (4) politically restrictive measures intensify labor's political determination; (5) major deterrents to PAC-type activity lie outside government, or in the realm of public policy other than that of political regulation; (6) PAC's noticeable influence upon the American Way has been perhaps less remarkable than the extent to which it symbolizes an accommodation to it.

Microfilm \$8.35; Xerox \$29.70. 659 pages.

RICHARD HOOKER AND THE
CHRISTIAN COMMONWEALTH

(L. C. Card No. Mic 60-414)

Philip Bruce Secor, Ph.D.
Duke University, 1959

Supervisor: John H. Hallowell

Richard Hooker's fame has rested upon his elaboration of the doctrinal via media and the Church-state union which he saw embodied in the Elizabethan Settlement in England and which he defended in his influential work, Of the Laws of Ecclesiastical Polity (1593-1600). Hooker's lasting importance to students of politics derives from his thoughtful consideration of a perennial philosophical question: what is the relationship between man's view of reality as reflected in his social arrangements, and that ultimate reality in terms of which thoughtful men since at least the time of Plato have felt compelled to judge or justify their institutions?

The key to an understanding of Hooker's ideas about the political order is his philosophical moderation, his insistence that truth lies in the mean between extremes. There is an ultimate reality (God) which must always be distinguished from men's way of conceiving reality. Nevertheless, man is not totally separated from God, and the principal means through which he finds God, reason and revelation, are not mutually exclusive but complementary.

In Hooker's view the Puritan religious and political ideas which were rampant in his time threatened the philosophical basis of traditional Western political organization. He argued against what he considered to be the Calvinists' separation of reason and faith and their insistence that all human institutions founded on man's use of reason are corrupt and totally separated from God and His Laws. Hooker insisted that this total separation of revelation from reason could lead only to rule by the private wills and opinions of a self-proclaimed "elect" who alone had received God's complete and pure revelation

in Scripture. The wisdom of the ages, the traditional interpretations of reality by the finest minds of the historical Church must not be discarded in the face of what was, in Hooker's view, no more than the mere opinion of Calvin and his followers.

Hooker incorporated his systematic defense of the validity of the traditional union of reason and faith in an exposition of what he saw as the organic embodiment of the public reason and consent of the English people through history, i. e., the English Christian commonwealth. In this commonwealth, one finds repeated affirmation of Hooker's belief that the temporal and the spiritual, although different states of being, are yet, through God, joined. Thus Church and state cannot be separated for they are indivisible aspects of one body--the Christian commonwealth. The commonwealth reflects the union in man of the divine and the human in the political indivisibility of Church and state. As a consequence human laws are reflective of God's Laws without being identical to them; kingship may, under certain conditions, be divinely established, but the will of a King is not to be equated with God's will; historical popular consent to acts of a government may reflect God's approbation but such consent does not guarantee divine sanction.

The political ideas of Richard Hooker differ fundamentally from both the absolutism of Hobbes and the modern democratic theory of popular consent exercised through effective and regularized restraints, although he has been used by advocates of both modern schools of thought. His theories of man's nature, purpose and relation to God reveal Hooker as an advocate of limited government in the medieval tradition of Bracton and Fortescue.

Microfilm \$5.40; Xerox \$19.15. 424 pages.

RESPECTING THE ESTABLISHMENT OF
RELIGION IN COLONIAL AMERICA

(L. C. Card No. Mic 60-475)

William Fife Troutman, Jr., Ph.D.
Duke University, 1959

Supervisor: John H. Hallowell

Anglicanism, as it was instituted by the Elizabethan Settlement in 1559 and approximately duplicated in six of the English provinces in North America, serves in this study as the point of departure for defining an establishment of religion and for interpreting viewpoints on church and state prominent in America before 1775. In theory and practice Anglicanism was faithful to the traditional conception of the Christian society as an organism resulting from God's providential intervention in the corporate life of the community which officially committed itself to the Christian religion. Through custom and tradition, through the general outlines of cultural development, and through positive human laws enacted by representative political agencies, God was supposed to intimate in the corporate history of a given community the best pattern of social organization. Anglicans accepted this social pattern as an expression of God's natural law and assumed that the natural law dictated that the society be integrated as both a visible church and a civil commonwealth under

a unified administration. Such a conclusion was premised on the theory that the visible church and the civil state were connatural institutions under the law of nature and that the visible church differed from the state only to the extent that it administered the divine law through consecrated spiritual officers.

Congregationalists in Puritan New England betrayed suspicion concerning the reliability of the rational faculties of mankind in the general, and insisted that religious and moral truths were mediated by God through the Scriptures only to His elected saints in the "gathered church." Impelled by such convictions, the Congregationalists abandoned the organic theory of society and substituted for it the covenant or compact theory according to which the Christian individual through voluntary action became the secular agent by which the visible church was instituted. In this system the church was distinguished from the civil state; and theoretically the two institutions were separated. But their obsession for a holy commonwealth inspired the Puritan Congregationalists to enlist the civil governments as co-agents of a Christian community exercising under the biblical constitution a "coactive" power to enforce religious orthodoxy upon one and all.

Baptists in colonial America followed the lead of Roger Williams in emphasizing an acute dichotomy between the divine and natural law, between the spiritual and the secular, and between the church and the state. Consequently, they came to regard Christianity substantially as an inner condition of the spirit and the visible church virtually as a secular fellowship of kindred souls consenting to maintain community as long as they found personal satisfaction in the fellowship. Christianity, argued the Baptists, was doomed by any society--church or state--which did not honor the principle of private judgment in religion.

John Wise, in the early eighteenth century, adapted the doctrines of the European rationalists to New England Congregationalism in such a way that the church was re-defined as a convenient social facility which shared with the civil government the responsibility for upholding a secularized moral law of nature without, at the same time, attempting to interfere with individuals in matters of conscience.

Colonial Presbyterians and Quakers manifested equivocal attitudes toward religious establishments. While they both opposed official policies enforcing strict conformity to any particular church, their endorsement of a peculiarly Christian moral law encouraged them to support an establishment of the Christian religion through civil agencies in the American colonies.

Microfilm \$7.55; Xerox \$26.80. 593 pages.

POLITICAL SCIENCE, INTERNATIONAL LAW AND RELATIONS

FRENCH POLICY TOWARD MOROCCO: 1944-1956.

(L. C. Card No. Mic 60-16)

Margaret L. Hamilton, Ph.D.
Columbia University, 1959

This thesis is a study of French policy toward Morocco from 1944, the year in which the Moroccan Nationalist Movement, calling itself the Istiqlal Party, first became a strong, united organization, demanding the severance of all political ties with France, to 1956, the year in which Morocco achieved its independence.

In reviewing the history of relations between France and Morocco during these years, the writer was impressed by the fact that over and over again the Metropole failed to undertake basic reforms in the Protectorate until an exploding crisis finally forced the Government to grant minor concessions in the hope that these would aid in the restoration of peace and order. But the concessions were always too few and they always came a little too late; France never seemed ready or able to institute changes at the moment when they might have stopped, or at least, delayed, the drift toward independence.

The object of this study, therefore, is to explain why France followed the policy that it did during the years under consideration. Thus, an attempt has been made to identify the specific forces which exerted a strong influence on French policy and to describe how they operated. On the one hand, these forces included the groups which had a vested interest in maintaining the status quo in the Protectorate, such as the colon, the military services, and the French administration in Morocco. In opposition to them was the Moroccan Nationalist Movement supported by the Sultan.

However, these forces could not have operated as they did had it not been for the very nature of the French Government. Unstable, fluctuating coalitions meant that there could be little continuity of policy, and, in addition, seldom could a positive program be formulated and carried to completion because Premiers had to satisfy diverse elements within their Cabinets. Therefore, they tended to follow a policy of *immobilisme* in an endeavor to keep the support of groups on both the Right and Left of the Assembly.

Had there been an agreement in France on fundamental values and a consensus as to the form of government which the country should have, it is unlikely that the basic clashes between parties of the Left, Center, and Right over colonial policy would have arisen, and probable, therefore, that a much more consistent, positive program toward the Protectorate could have been developed.

Finally, had the Government taken a more realistic view of the Nationalist Movement by granting basic concessions, and had it not relied solely on the use of force, France surely would not have expended the great numbers of lives nor the tremendous sums of money that it did in the effort to maintain its hold over Morocco. And, it is probable also that France's prestige and influence in its former Protectorate would be much greater than it is today.

Microfilm \$2.95; Xerox \$10.35. 228 pages.

TOWARD EUROPEAN UNION

(L. C. Card No. Mic 60-666)

R. Chu-Kua Huang, Ph.D.
University of Kentucky, 1953

Western Europeans have finally come to the conviction that the solution to their common but urgent problems must be sought on a European basis, keeping in mind the Soviet threat. Consequently Western Europeans began to seek European union through military alliances such as the Franco-British Dunkirk Treaty, the Brussels Pact, the North Atlantic Defense Treaty and the European Defense Community; and through economic cooperation, such as the European Recovery Program and the Organization for European Economic Cooperation, Schuman Plan (European Coal and Steel Community), Pflimlin Plan (Agricultural Pool); and through political integration such as the Council of Europe. All these efforts have resulted in considerable progress toward European union. Some very concrete steps have been taken, among them the Schuman Plan, with its supra-national character and the European Defense Community. An example of the change in atmosphere is the seating arrangement in the Consultative Assembly of the Council of Europe which is not by national groups but in alphabetical order of the individual delegates.

The task is still formidable. First, the Soviet Union, because of its fear of a cordon sanitaire, its race for world hegemony and ideological necessity, continues to oppose any kind of European union not under Soviet leadership. Secondly, France is distressed over the prospect of bringing Germany into a European community. Thirdly, England and the Scandinavian countries on one hand, and the continental powers on the other hand, disagree on the approach to the problem. The former prefer the "functionalist" and the latter the "federal" approach to European Union. Soviet opposition could be balanced by American support, for the Soviet Union will not start an all-out war against the West merely for the prevention of a European union. The rapprochement between France and Germany would be aided by British participation, since British power could nullify the threat of German domination within the union. The difference between the two approaches could be overcome by progressive means: the arousal of public support, piece-meal federation through Functionalist approach, political federation through economic union, the federation of those who will and can unite in a nucleus federation, which may expand through democratic principles when time ripens and when the situation permits.

So far the European Coal and Steel Community has made the most impressive progress. Its Assembly has just decided to draft plans for a political federation of the six nations by March 10, 1953, whose work might be, according to their understanding, transferred to the European Defense Community which is expected to be established by that time. Thus a European union seems definitely in sight. Certainly, it is quite correct to point out that military alliance and economic cooperation do not necessarily lead to union; many times European countries in the past have committed themselves to military alliances and economic cooperation, yet none of these led Europe to union. But the present situation is different. European statesmen such as Paul-Henri Spaak of Belgium,

Robert Schuman of France, Konrad Adenauer of Germany and deGasperi of Italy, unlike the statesman of the past, are all working together for a European union. The present military alliances and arrangements for economic cooperation are aimed at creation of a European union. What is most important of all, public opinion in Europe, particularly on the continent, is quite favorable to the creation of a European union. European youth are particularly enthusiastic. For the present the most fundamental concern that European countries have is how to maintain permanent peace, security and prosperity in Europe. Actually, it is a question of survival.

Microfilm \$2.50; Xerox \$8.80. 192 pages.

THE DEVELOPMENT AND MAINTENANCE
OF THE AMERICAN NAVAL ESTABLISHMENT,
1901-1909.

(L. C. Card No. Mic 60-48)

Albert Charles Stillson, Ph.D.
Columbia University, 1959

Three insights into the formulation and political nature of military policy are suggested by an analysis of images and attitudes held by high-ranking naval officers, key members of the Theodore Roosevelt administration, and members of Congress when these military men and politically influential civilians worked together in the building and maintaining of the American naval establishment:

1. Naval officers' recommendations for naval policy were made from the "military point of view." The "military point of view" rested essentially upon political images and political evaluations and judgments defining America's role in world politics and determining why, against whom, when, and how the United States would have to employ naval power. Even recommendations usually thought of as technical, "military" decisions—such as those for naval bases—were intimately related to political images and political evaluations and judgments.

Other images and attitudes held by naval officers convinced them that the "military point of view" was apolitical. This conception allowed naval officers to include in the "military point of view" attitudes such as unwillingness to compromise the "right" dictates of "naval science." It allowed them to make judgments about domestic politics. And it permitted issues of intra-navy politics to affect "military" recommendations.

2. Influential civilian had an incomplete understanding of the political character of naval policy. They felt incompetent to judge "military questions" and to give policy direction to military men on "military" matters. Yet, they believed that the "military point of view" should not be accepted when it conflicted with the "political point of view."

In deciding broad questions of naval policy—probable enemies and probable wars, for example—influential civilians employed their own images of world politics and the international position of the United States to make the "political point of view" prevail over the "military point of view." To evaluate so-called technical, "military" recommendations—those for the composition of the navy (numbers and types of ships), the location of naval bases,

and the maintenance of the navy—influential civilians relied on criteria such as the money-cost of the navy and the competence and trustworthiness of naval officers. These criteria were judged relevant and applicable to naval policy, because they were part of the "political point of view," and because the "political point of view" should take precedence over the "military point of view."

3. Lack of understanding of the political character of military policy impeded both high-ranking naval officers and influential civilians from formulating and implementing a logical, consistent naval policy. Naval officers based their recommendations on political evaluations and judgments which they probably were not competent to make. However, it can be said in naval officers' defense that they received little policy guidance from influential civilians.

Except for basic and elementary decisions about naval policy—the number of battleships needed, for example—influential civilians evaluated naval officers' recommendations not according to the political issues underlying naval policy but according to money-cost in itself and similar criteria. Civilian rejection of naval advice was usually based on such non-rational considerations. When influential civilians accepted naval officers' recommendations, they implemented political evaluations and judgments (that is, naval officers') with which they often disagreed, or which they should have challenged and examined. When influential civilians accepted some of naval officers' recommendations (for a base in the Philippines, for example) but rejected other of their recommendations (for the construction of cruisers, say), important parts of American naval policy were thus founded on different—and sometimes totally different—sets of political and politically related evaluations, judgments, and attitudes.

Microfilm \$5.70; Xerox \$20.05. 445 pages.

THE INTERNATIONAL LEGAL PERSONALITY OF THE UNITED NATIONS

(L. C. Card No. Mic 60-54)

Guenter Weissberg, Ph.D.
Columbia University, 1959

International law has reached a stage of development in which it can no longer be considered as a system which consists exclusively, or even primarily, of principles which govern the mutual relations of states. The international legal order has witnessed the establishment and growth of a large number of international organizations which perform international functions, possess international rights, are bound by international obligations, and are endowed with international juridical personality.

This study has been concerned with the international legal personality of the United Nations. Such a characteristic cannot be conceived on the basis of preconceived notions. On the contrary, it must be tested in a pragmatic manner by reference to the functions which a particular entity may perform. Thus not all of the objectives which an organization may undertake are material. It is only those express powers which *ipso facto* reveal, or from which a reasonable inference may be drawn, that they manifest this concept which are of import. Moreover, the interpretation and detailed application of such express

functions, as well as of those objectives which at first glance would not seem to disclose any facet of that personality, are of even greater significance for the purpose of determining that personality, and more particularly the scope and magnitude of this trait.

The evidence has left no room for doubt that the United Nations is a subject of international rights and duties. An attempt has been made to show the extent of that personality. After having established the foundation and connotation of this concept, the development of the international legal personality of the world organization has been analyzed. Thus one of the chapters of this manuscript is devoted to the treaty-making power of the United Nations. This has revealed that the organization has entered into extensive treaty relations with independent states and with other subjects of international law. Emphasis has been placed not only on the format of these agreements, but on the subject matter which has been regulated as a result of them, and on the legal steps which are essential before such instruments can enter into force. As a consequence of these treaties, the organization has been granted numerous international rights and has assumed a vast number of international duties both from a substantive and a procedural point of view.

In another chapter the Korean conflict, in so far as it has an impact on the personality of the organization, has received extensive investigation. For this action illustrates the application of military sanctions and the implications of such an undertaking, and demonstrates that the organization possesses a power which in inter-state relations is termed the *jus belli* and in the organizational sense is known as a collective enforcement procedure.

The United Nations Emergency Force is the next major element which has been examined. This Force and the ramifications which have been involved are important links in the chain which bear on the personality of the organization. Thus, for example, the writer has concentrated on the role which the Secretary-General has played in this connection, as well as on the consensual issue and the question of the termination of the functions of UNEF.

The privileges and immunities of the United Nations, as indicated in international instruments and in municipal legislation of states, form the basis of another chapter of this monograph. And in this context the organization's right of active and passive legation is detailed and the foundation of this capacity is explained.

The next significant factor which has been scrutinized is the ability of the United Nations to espouse international claims not only for direct damages to the entity but also for indirect ones. Here particular attention has been focused on the procedural capacities of the organization both in regard to such claims and in more general terms.

While these are the principal aspects to which this project has been devoted, other facets, such as the power to acquire title to territory and the right to participate in the formulation of rules of international law, have been taken into account. All of these elements support the doctrine that the organization is an international legal person and disclose the extent of its personality.

In spite of the fact that the international legal personality of the organization is incapable of closing every *lacuna*, it is an indispensable requisite for achieving the purposes of the organization. And while it must be employed in conjunction with the primary aims of an entity, such an association enables the United Nations to assume

secondary functions which may be more important than the basic ones. Thus the organization is able to expand, develop, mature and grow, and empowered to enter fields as yet unexplored.

Microfilm \$6.85; Xerox \$24.30. 539 pages.

POLITICAL SCIENCE, PUBLIC ADMINISTRATION

NEW YORK STATE WATER POWER AND CONTROL COMMISSION

(L. C. Card No. Mic 60-384)

William Merrill Shear, D.S.S.
Syracuse University, 1959

Supervisor: Roscoe C. Martin

This is a descriptive study of the New York State Water Power and Control Commission, the primary State agency in the field of the administration of water resources. It is intended to illustrate the work of an administrative agency in New York, pointing out both its shortcomings and good points. With increasing demands on water supplies in the eastern United States, the administration of these supplies is becoming increasingly important.

By pinpointing the work of the Water Power and Control Commission through an investigation of its history, programs, and relationships with other agencies and levels of government, it is hoped that this study may aid in an understanding of what may be done to improve state administration of water resources.

The methods used in writing this study were historical

documentation, legal search, interview and direct observation. The first step was a search of State agency reports and legal documents. During the preparation of the paper New York laws were constantly referred to, especially the Conservation Law. After the historical and legal bases were established, the more direct and informal workings of the Commission were investigated by personal interview and by direct observation. In addition to many days spent in the offices of the Commission, the author attended hearings in several sections of the State. One of the most fruitful methods of research was being present in the office for several days at a time, a method close to participant observation. At these times the author almost was regarded as part of the staff of the Commission.

One of the outstanding characteristics of this agency was found to be the importance of individual personalities. In over thirty years of existence the chief executive position has been held by only two men. These men have been influential in determining State policy regarding water resources administration. The engineers who work for the Commission hold water supply hearings in which a legal background would be helpful. All of the engineers who hold these hearings are not equally adept at handling legal situations and at writing tentative decisions to be approved by the Commission. They have on-the-job training, and new engineers do not hold hearings on their own until they are considered qualified.

In general, the Commission has exercised its duties and functions efficiently, but has worked under a narrow interpretation of the Conservation Law. As water problems are becoming more intense, there is a more intense need for water resources planning on a State-wide basis. This function has not been exercised by the Water Power and Control Commission. Also, it is possible that a need may arise for actual development of water resources by the State. This is, at present, outside the scope of the major water resources administrative agency of the State.

Microfilm \$3.45; Xerox \$12.60. 268 pages.

PSYCHOLOGY

PSYCHOLOGY, GENERAL

A STUDY OF THE RESPONSES OF BLIND AND SIGHTED INDIVIDUALS TO THE KUDER PREFERENCE RECORD

(L. C. Card No. Mic 60-261)

William M. Cannon, Ph.D.
Duke University, 1959

Supervisor: G. Frederic Kuder

The purpose of this study was to investigate the way in which blindness and certain concomitant conditions of blindness influence measured patterns of vocational interests on the Kuder Preference Record, Vocational. Predictions were formulated in an attempt to point up the specific effects upon interests of visual acuity, age at onset

of blindness, percent of life blind, and educational experience in a school for the blind and in public school. For this study a special electro-mechanical testing instrument was devised to make the Preference Record equally available to blind and sighted subjects. Special attention was paid the relative stability of the Kuder Preference Record administered by means of this radically different method. As a further study of the effect of this new methodology and instrumentation, measured time for the test administration was held to be an important index to the efficiency of the new method. A phase of studying the general applicability of these new methods to blind populations included the investigation of the acceptance-rejection attitudes of blind subjects toward the testing instrument and the requirements of the testing schedule. It was also deemed desirable to study the relationship between measured and expressed interests of blind and sighted groups.

Responding to logically derived hypothetical antecedents

discussed in terms of experiential history as controlled by blindness specific predictions were set forth relating these experiential controls and their effect upon experience and hence upon interest formulation to the magnitude and direction of measured interests of blind and sighted groups. Seventy-seven blind white rehabilitation clients ranging in age from eighteen through thirty-five, and fifty-nine white male subjects applying for employment at an office of the Employment Security Commission, also ranging in age from eighteen through thirty-five, were given the Preference Record.

The main results of the study may be summarized as follows:

1. One of the most noteworthy findings is the remarkable similarity between the interest patterns of blind persons and those of both the sighted experimental population and the Kuder norm group.
 2. There seems to be a real tendency for blind persons to obtain generally higher scores in those areas judged to be blind-appropriate, namely, Mechanical, Persuasive, Literary, Musical, Social Service, and Clerical. Many of these differences are statistically significant at the 1% and 5% levels of confidence.
 3. The most revealing differences between means of sub-groups made up of blind individuals and the mean for the Kuder norm group were observed when the blind sub-groups were defined in terms of educational experience, thereby compounding the effects of educational experience, age at onset of blindness, and degree of blindness.
 4. The Kuder Preference Record retained remarkably high stability as measured by the Kuder-Richardson technique for estimating reliability.
 5. The blind population tended to be considerably more restricted than the sighted population in the number of different occupational titles expressed as preferred occupations. The expressed job titles for the blind population followed, for the most part, the same predicted pattern as for measured interests, i.e., job titles of this blind group were appropriate to interest areas which had been judged to be blind-appropriate. A tendency exists for expressed interests of blind persons to cluster about jobs stereotyped in the employment of blind persons. The sighted population showed greater diversification of job titles.
- The degree to which expressed and measured interests of the sighted and blind populations were found to be in agreement seemed to be approximately the same. Test validity reflected in this finding showed no difference between such validity for the two experimental groups.
6. The time required for administering the Preference Record to blind persons was cut from approximately two hours to less than one hour.
 7. The attitudes of blind subjects toward the new testing instrument and technique were, for all cases, characterized by strong acceptance reactions.

Microfilm \$2.50; Xerox \$7.60. 167 pages.

SOME MATERNAL INFLUENCES ON CHILDREN'S PERSONALITY AND CHARACTER

(L. C. Card No. Mic 59-3699)

Joseph Claude Jeans Finney, Ph.D.
Stanford University, 1959

Few studies of parent-child influences have combined (a) investigation of a broad range of parent and child characteristics, (b) quantitative measurements subject to sophisticated mathematical analysis, (c) selection of hypotheses suggested by psychoanalytic and other clinical impressions with depth and subtlety, and (d) the hypotheses organized coherently as deductions from more basic general laws within a larger science of behavior. The recent studies of Sears et al. (*Patterns of Child Rearing*) are outstanding in all these respects. The present study was an attempt to extend that work in certain directions.

Thirty-one male children seen at a child guidance clinic were scored, by a combination of clinicians' and teachers' ratings, for pessimism, dependency, anxiety, conscience, repression, overt aggression and covert hostility. Their mothers were scored independently, by a combination of ratings from recorded standard interviews and those by clinicians, for nurturance, hostility, rigidity, hysterical character (repression), achievement need, failure to be firm, and selective tendency to reinforce the child's dependent behavior (overprotection). Some predictions about mother-child relationships were made on the basis of current theories derived from clinical practice and from the experimental psychology of learning.

Of the 21 predictions made, all but one came out in the predicted direction, and 11 of them above the 5% level of significance (six on simple correlation and five more on partial correlation). Maternal nurturance was found to lessen the child's pessimism, dependency, anxiety and passive hostility, and to expedite the child's development of conscience. The alleged effects of too much maternal nurturance in "spoiling" the child, i.e., making him dependent and conscienceless or self-centered, were found to be the results, instead, of two other maternal variables, namely, (a) selective reinforcement of dependent behavior and (b) failure to be firm, respectively. Maternal nurturance, in fact, had somewhat the opposite effect on both of those behavior qualities in the child. Maternal hostility and rigidity tended to make the child pessimistic and resentful. The child's use of repression was found positively related to the mother's use of the same defense. Some of those relationships were shown more clearly when masking effects were eliminated by appropriate partial correlations. The maternal variables studied accounted at their maximum for 55% of the variance in the child's covert hostility, 40% of that in his dependency, 31% in his pessimism, 22% in his conscience level, 22% in his total hostility or aggression drive, 18% in his overt aggression, and 14% of the variance in his anxiety.

The interrelationships of the various variables within the child, and those within the mother, were also studied. The chief findings here were the positive relationships among dependency, anxiety, pessimism and covert hostility as rated in the children. In the mothers, ratings of nurturance and overprotection were substantially related, as were ratings of rigidity and firmness.

Microfilm \$5.40; Xerox \$19.00. 423 pages.

A COMBINATION OF FORCED CHOICE AND CHECK LIST RATING SCALES FOR THE EVALUATION OF INSTRUMENT FLYING PROFICIENCY

(L. C. Card No. Mic 59-5385)

Fred Ernest Holdrege, Jr., Ph.D.
The Ohio State University, 1953

Extensive research has been conducted in attempts to use rating scales in evaluating instrument flying proficiency. These attempts have used various types of check list and graphic rating scales. No record of an attempt to use a combination of forced choice and check list scales could be found by the researcher. In order to have an outside criterion to evaluate such a combination, it was decided to construct a rating scale for use in evaluating instrument flying proficiency in the Link trainer. This would allow grades given by the check pilot on an instrument flight check to be used as the outside criterion. In order to further limit the scope of the study, performance evaluation was limited to the radio range phase of instrument flying.

A method of combining forced choice and check list rating techniques was developed for use in the study. Since the combined system incorporates the main features of both check list and forced choice scales, it has been called a "Duplex Rating System."

The system, when applied to the evaluation of instrument flight check performance, consists of items similar to the following:

- y n Very good beam following
- y n Very good cross-check of instruments

The instructions for completing the item are as follows:

1. Considering the pilot in relation to other pilots, is the first phrase descriptive? If the phrase is descriptive, circle "y" for yes. If the phrase is not descriptive, circle "n" for no.

2. Repeat this process for the second statement of the pair.

3. Cover up your y and n answers with your thumb. Draw a line through the less descriptive statement. Be sure that you cross out one phrase in each pair.

Here is an example of how the completed item might look:

- (y) n Very good beam following
- (y) n ~~Very good cross-check of instruments~~

This would indicate that the pilot did a good job of following the beam and at the same time kept a good cross-check on his instruments. However, "Very good beam following" is more descriptive of his performance than is "Very good cross-check of instruments." Hence, the rater crossed out "Very good cross-check of instruments."

Items from practically any type of rating scale can be expressed as duplex items. Examples of conversion of (I) Check List, (II) Forced Choice, and (III) Graphic rating scale items follow:

I. CHECK LIST ITEM

Maintained airspeed within 5 mph _____

Maintained airspeed within 10 mph _____

Airspeed varied more than 10 mph _____

DUPLEX CONVERSION

- y n Maintained airspeed within 5 mph
- y n Maintained airspeed within 10 mph

II. FORCED CHOICE ITEM

- _____ Very good beam following
- _____ Very good cross-check of instruments

DUPLEX CONVERSION

- y n Very good beam following
- y n Very good cross-check of instruments

III. GRAPHIC ITEM

BEAM FOLLOWING

Failing	Poor	Average	Good	Excellent

DUPLEX CONVERSION

- y n Beam following a little weak
- y n Very good beam following

When the duplex item was made up of items matched for preference index and mean, as is normally done in forced choice rating scales, it was called a "controlled forced choice item." When one positive item was paired with a negative item, the duplex item was called an "uncontrolled forced choice item."

In the study, a check list scale was constructed which consisted of empirically selected items. These items were called "empirical check list items." This scale was expanded by adding items selected by Link trainer operators as adding to the validity of the empirical check list scale. These items were called "expanded check list items."

A general subjective scale was included to obtain a final over-all rating of the pilot's performance:

Poor	Weak	Average	Sharp	Outstanding
1	2	3	4	5

When the various scales were correlated against the general flight check rating made by the check pilot on the pilot's performance during the flight check in an airplane, the following correlations were determined:

TABLE 1
CORRELATIONS AGAINST
FLIGHT CHECK CRITERION

Variable	Correlation
Controlled forced choice	.17
Uncontrolled forced choice	.41
Empirical check list	.48
Expanded check list	.41
General subjective	.49
Duplex \bar{R}	.51

A factor analysis was performed to clarify the inter-relationships of the various rating scales. The analysis indicates that the individual raters have a high degree of specificity in their evaluations of performance.

The analysis also indicates that the controlled forced choice rating scale reflects some aspect of instrument flying not revealed by the general subjective scale or the check list scales. This aspect of the proficiency ratings could not be adequately interpreted from the data available. Mechanical recording equipment would have to be used to adequately interpret these ratings.

The duplex rating system was found to be sufficiently flexible to be practical for use in many rating situations.

Microfilm \$2.50; Xerox \$5.00. 92 pages.

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THE SHOP STEWARD: AN ITEM-FACTORIZATION OF UNION ATTITUDES.

(L. C. Card No. Mic 60-750)

John Joseph Hopkins, Ph.D.
The Ohio State University, 1959

The attitudes of shop stewards in a union local have been studied in an effort to bring about greater understanding of the meaning that this necessary position has for the men who hold it.

In response to specific items these men have indicated a sense of satisfaction stemming from their increased knowledge of the things taking place throughout their plant. This knowledge has come to them primarily because they are the essential agents of communications within a union local. They have indicated that they considered becoming a steward for many different reasons, especially the anticipation that being steward would train them for some future possibilities. These men also feel that having been a steward has not actually increased their chances for promotion within their company. These stewards have pointed out faults in their company; for example, the large number of "white collar workers" in proportion to the number of production workers. However, they have maintained that as a whole they are well satisfied with their company.

The factor analysis of the responses of the stewards indicated four major attitudinal areas, with three of these four having subareas. The first of these major areas, Militant Unionism, is seen as opposed to the previously mentioned satisfaction with the company, and tends to challenge the concept held by some that the filing of grievances is the most important aspect of a steward's job.

The other major factors derived from this research include a generalized Pride in Union Activities and a more specific Pride in the Steward's Job. Finally, there is an area of attitudes dealing with the necessity for dispensing information as indicated by the factor of Union Communications.

A distinct lack of reliability in evaluating the effectiveness of steward performance was evidenced in this study. Thus, it was impossible to distinguish between the attitude pattern of the "good" and "poor" stewards. The question of whether or not a criterion is possible for judging

stewards is left untouched. However, the results indicate that any criterion which involved the number of grievances filed would be decidedly open to question.

Despite the inability to relate any factor of steward attitudes to a criterion of steward quality, some interesting relations were found in this research. Several items of personal information were shown to be related to certain attitudes. The findings demonstrate that stewards, and presumably all union officers, have differences in the degree to which they possess certain attitudes and that these differences are related to the person's age, number of dependents, labor grade, and/or other items of personal information. Thus is seen a need for the re-evaluation of union attitudes at the level of the individual leader rather than the group. Perhaps this is the most significant finding of the research. It indicates that when we consider the attitudes of union leaders, these attitudes may be viewed along a relatively small number of dimensions; moreover, a group of union leaders will not maintain these attitudes to a common degree, but the extent to which they hold certain attitudes will vary for members of the group as a function of their age, labor grade, and other personal characteristics.

Microfilm \$2.50; Xerox \$3.80. 68 pages.

A PRELIMINARY STUDY OF THE DIMENSIONS OF FUTURE TIME PERSPECTIVE

(L. C. Card No. Mic 60-394)

Robert Jay Kastenbaum, Ph.D.
University of Southern California, 1959

Chairman: Professor Guilford

The concept of future time perspective has an important explicit or implicit role in many theoretical formulations of human behavior. Recent experimental work suggests that such varied problems as academic achievement, schizophrenia, juvenile delinquency, and socioeconomic class differences can be approached fruitfully through the study of this variable. The present investigation was intended to contribute to the clarification of future time perspective as a variable in psychological theory and research. The basic question was: Is future time perspective a relatively unitary variable? Secondly, an exploration was made of the relationship of specific future time perspective measures to selected measures of intelligence and personality.

The future time perspective concept was logically analyzed, carrying further the work of Melvin Wallace ("Future Time Perspective in Schizophrenia," *J. abnorm. soc. Psychol.*, 1956, 52, 240-245). Four logically independent variables emerged from this analysis: (1) future extension, defined as the range of the future time span that is conceptualized; (2) future coherence, defined as the degree of organization of the future time span; (3) future density, defined as the number of events and experiences anticipated for the future; and (4) future directionality, the sense of moving swiftly and unequivocally from the present moment to the future.

A battery of tests was prepared to measure the future time perspective variables that emerged from the logical analysis. The final battery included: (1) story completion

tasks to measure extension; (2) a sequence arrangement test to measure coherence; (3) two measures of density—predictions of events and experiences, and forecasting of future roles and identities; and (4) a Time Metaphor Test to measure preferences for static, as contrasted with moving, directional images of time. Also included in the battery was a Personality Rigidity scale, and a Need-for-Freedom scale.

The battery was administered to 209 high school students (107 males, 102 females) enrolled in courses required of all students. Scores on the California Mental Maturity Test were made available by the high school's counseling service.

Results. Two levels of data analysis were employed. First the intercorrelations computed among scores on all measures were inspected, then a centroid factor analysis was performed on the correlation matrix. Inspection of the intercorrelations revealed that the variables of density, extension, and coherence were related in a positive, statistically significant manner. The directionality variable was distinct from the others, suggesting that it be tentatively considered as an independent aspect of future time perspective. It was shown that there is an important distinction between temporally structured and temporally unstructured conditions in their effects upon the extension of thought into the future. People with high scores on future time perspective variables tended to be of higher intelligence, but this relationship was weak; there was also a positive but very weak relationship between future scores and the constellation of low-rigidity-high-need-for-freedom. No appreciable sex differences were noted.

The most general factor obtained after orthogonal rotations appeared to embrace most of the variables of future time perspective; the measures of density, extension, and coherence had their highest loading on Factor I. Factor II was related to the intelligence and personality variables along with future directionality. Factor III was a doublet for the density variable. The discussion emphasized the potential value in future studies investigating the variables explored here along with variables of conceptual foresight, perceptual foresight, level of aspiration, and response inhibition. Microfilm \$2.50; Xerox \$5.00. 99 pages.

ACQUISITION OF AVOIDANCE DISPOSITIONS BY SOCIAL LEARNING

(L. C. Card No. Mic 60-445)

Norman Miller, Ph.D.
Northwestern University, 1959

Adviser: Carl P. Duncan

To determine whether rats can acquire knowledge about an environment by exposure to the pain responses of other rats, 64 albino rats were placed in distinctive compartments with stimulus rats in identical adjacent compartments emitting pain cries. For half the Ss, pain cries were paired with black, for the other half, white.

Two polar points on confinement and shock variables in addition to the color variable created the eight cells of the factorial design. Half of the Ss in each color group were permitted to make an escape response from the

squeal compartment to an oppositely cued non-squeal compartment. The Confined half of the Ss were paired with the Escape Ss and retained in the presence of squealing for a time interval equal to the latency of the escape response of their mates in the Escape group on that trial number. Thus, length of exposure to squealing was controlled for Escape and Confined groups. Half of the Escape Ss and the half of the Confined Ss with whom they were paired had previously been given pretraining in a neutral environment in which another rat's squealing was a CS for shock to the S. The other half of the Ss had simply been placed in the pretraining box with another rat for a comparable amount of time with neither animal ever receiving shock. Following five days of 10 min. pretraining (with 20 pairings per day of shock and squeals for Shock groups) the pairing of black or white cues with squeals was initiated. During this stage, Ss received 10 trials a day but each daily session was preceded with 2 1/2 min. of the pretraining. Following 50 trials in which squeals were paired with alley color cues, all Ss were given 20 massed trials in which they were required to choose, without the benefit of squeal cues, between the black and white compartments from an enclosed space in the center of the two. In all cases S was punished for a black choice with a mild delayed shock. Thus, strength of prior learning to approach or avoid particular color cues would be reflected by differential transfer from prior training; in subgroups in which squealing was paired with black, better learning should yield more positive transfer; when paired with white, better learning should yield more negative transfer.

Results showed that during training, Escape groups who had previously had pretraining pairing shock with squealing showed a continued decrease in latencies of escape response from the stimulus of squealing. Latencies did not appear asymptotic after 50 trials. Escape groups with neutral pretraining showed no shift in latencies over trials.

In the final two-choice acquisition stage, shocked groups (squeals paired with shock in pretraining) showed more positive or negative transfer (positive for groups trained to run from black and negative for groups trained to run from white) than Non-shock groups. Escape groups showed more positive or negative transfer than Confined groups.

In general, in the final two-choice situation, the number of trials on which S had to be forced to make a choice varied over color groups as a function of degree of learning; the greater the learning in the White groups the greater the number of forced choices; the greater the learning in the Black groups, the fewer the number of forced choices.

Laws of conditioning, secondary reinforcement, and conflict were related to the response measures in the discussion and seemed quite successful in explaining the results. Microfilm \$2.50; Xerox \$4.60. 89 pages.

**PREDICTING GENERAL ACADEMIC ACHIEVEMENT
FROM STANDARDIZED TEST SCORES AT THE
UNIVERSITY OF HOUSTON FRESHMAN LEVEL**

(L. C. Card No. Mic 60-119)

James Henry Morriss, Ph.D.
University of Houston, 1960

The University of Houston Counseling and Testing Service is charged with the responsibility of testing, counseling, and guiding all students who enter the University as freshmen. This program begins when the student applies for admission and takes a battery of standardized tests, and continues until he acquires thirty semester hours of college credit, or full sophomore status. The purpose of the initial, or testing phase of this program is dual in nature. First, the relative achievements of each student are measured by comparing his scores on standardized tests with those obtained by thousands of other students who have entered the University as freshmen, and upon whose scores the norms for the tests are based. The second aspect of the program, and the one in which this investigation was chiefly concerned, is the use of these various standardized tests for the purpose of placing the student in his proper area of study and predicting his chances of success in the college courses required in his chosen field.

Since the initiation of this comprehensive testing program in 1955, at which time the correlation data comparing success in courses of study with scores achieved on standardized tests were admittedly rather sketchy, cutting scores and norms have been constantly revised and modified as experience has been gained in the program. Using the information collected over a two-year period on more than three thousand freshman students, three IBM programs were prepared in order to evaluate the data. These programs were designed to gather the data, to print out distributions of letter grades received in each college course at predetermined raw score intervals of each standardized test, to calculate number and percentage probability distributions on progressively summated raw score intervals of the standardized tests, and to calculate chi-square and contingency coefficient values for measuring the degree of correlation between success and failure groups at the upper and lower levels of the standardized test scores.

Distribution tables were established relating grades received in college courses to scores made on standardized tests. These tables make possible the prediction of potential success or failure in a given college course when a raw score on a correlated standardized test is known. Also, by simple observation of the tables, the chances or odds of making a specific letter grade in a course are predictable.

Certain tests were found to be better predictors of success or failure than were others. Also, some college courses were found to be more susceptible to prediction than were others. For some courses, none of the standardized tests was an adequate predictor of success or failure, while for other courses, almost every one of the tests showed a significant degree of predictive ability. Generally, grades in subjects involving primarily linguistic skills were better predicted than were grades in the science and mathematics courses, although some biology courses showed excellent correlation with the standard-

ized tests. Pure mathematics and chemistry showed the least degree of correlation with the tests.

The use of the tables hereby established should provide the counselor with a valuable scientifically oriented tool to supplement his other methods of counseling and guiding the freshman student into a college curriculum which is compatible with his achievements, interests, and aptitudes. Microfilm \$2.50; Xerox \$8.80. 192 pages.

**INVENTORIED AND EXPRESSED VOCATIONAL
INTERESTS: THEIR INTRA-GROUP CONSISTENCY
AND INTER-PREDICTABILITY.**

(L. C. Card No. Mic 59-6381)

James Bradley Nickels, Ph.D.
University of Missouri, 1959

Supervisor: Dr. Robin J. Clyde

The study was conducted on 244 male and 160 female college students who volunteered to take the Strong Vocational Interest Blank (measure of inventoried interests) and an original Vocational Interest Rating Sheet (measure of expressed interests) in order to find out more about their vocational interests. After completing both instruments, the subjects were asked for a description of their fathers' occupation, which was later rated according to an occupational level classification based on the Dictionary of Occupational Titles.

After reviewing published research on inventoried and expressed interests and after advancing several hypotheses based on this review, the investigator analysed the intra-group consistency and inter-predictability of inventoried and expressed vocational interests. All hypotheses about inventoried interests, expressed interests, and occupational level were tested by means of chi square, except one hypothesis which was tested by a rank-order correlation coefficient. The major results may be summarized as follows:

For both sexes, inventoried and expressed interests related to one another.

For both sexes, inventoried and expressed interests failed to relate to paternal occupational level.

Men's own occupational levels failed to relate to their paternal occupational levels.

Men's inventoried-expressed interest agreement derived from occupational scale scores failed to relate to such agreement derived from occupational family patterns.

Women's expressed vocational interests were relatively stable over a period of a few months to a year.

For men, high inventoried interests better predicted high expressed interests than vice versa in popular occupational families, whereas low expressed interests better predicted low inventoried interests than vice versa in popular occupational families. When unpopular occupational families were considered, extreme expressed interests better predicted high inventoried interests than vice versa. The one exception to the trend was that extreme expressed interests better predicted high inventoried interests than vice versa in business occupations, regardless of their popularity.

For women, there was no observable trend relating

the popularity of the occupational families to the kind or quality of the prediction made.

For men, as the upper range of expressed interest ratings was restricted, expressed interests better predicted inventoried interests than vice versa; but as the upper range was extended, inventoried interests better predicted expressed interests than vice versa.

When men's high and low interests were combined, neither inventoried nor expressed interests were superior for predicting inventoried-expressed interest agreement, regardless of the occupational family considered. Women, however, opposed this trend, since for them inventoried interests better predicted expressed interests than vice versa.

When men's inventoried and expressed interests were combined, high interests were more predictive of inventoried-expressed interest agreement than low interests, regardless of the occupational family considered. Women, however, opposed this trend, since their high and low interests showed differential superiority depending on the occupational family considered.

For both sexes, one-sided predictability of inventoried-expressed interest agreement in a single occupational family was common, but mutual predictability of inventoried and expressed interest agreement in a single occupational family was rare.

Microfilm \$2.60; Xerox \$9.00. 200 pages.

THE EFFECT OF EARLY EXPERIENCE UPON THE FORMATION OF ENVIRONMENTAL PREFERENCES IN THE ALBINO RAT

(L. C. Card No. Mic 60-65)

Robert Albert Soskin, Ph.D.
Washington University, 1959

Chairman: Carl E. Sherrick

The main purposes of the study were to determine whether a preference for a unique and non-noxious environment could be established in the rat and whether such a preference is established during a critical age period during the development of the animal. Tests of the following specific hypotheses were made: 1) A preference for a mild, vibrating environment can be established in the rat. 2) There exists a critical age period during which preference for an environment is formed in the rat. 3) The critical age period occurs relatively early in the life span. 4) The mild, vibrating environment will also be preferred under emotionally stressful conditions.

Forty-six experimental animals were raised for a 21 day period in special cages, the floors of which transmitted constant, mild vibration. The frequency of vibration was 60 cycles per second. The amplitude of the vibratory stimulus averaged 385 microns on one floor and 355 microns on the second floor. At this intensity, one could feel a whirring or buzzing if he placed his finger on the floor. Forty-five control animals were maintained in cages that were similar in size and shape to the vibrating cages for a corresponding 21 day period. Separate groups of rats were exposed to the vibrating environment at three different age levels; 1 to 21, 22 to 43 or 44 to 65

days of age. One-half of the animals from each age group was tested 10 days following their exposure to vibration while the other half was tested at the age of 80 days. Control subjects were tested at comparable points in time. A single choice U-maze was used for the test of preference. One arm of the maze led to a goal box with a stable floor and the other arm led to a goal box with a vibrating floor. While under food deprivation, all animals were given 40 forced-choice trial runs, 20 to each goal box. The test proper consisted of 40 free-choice trials.

The results of the experiment may be summarized as follows:

- 1) Regardless of age, there was no experimental or control group that showed a preference for vibration. It was concluded that the amplitude and/or frequency of the vibration used in the experiment were of such magnitude as to constitute a noxious stimulus.
- 2) Rats raised in a vibrating environment from 1 to 21 days of age and from 22 to 43 days of age made more responses to vibration than their controls. The difference between the 1 to 21 day vibrated and control groups was significant at the .01 level. At the 44 to 65 day age level, controls made more responses to vibration than vibrated animals. These results were consistent whether rats were tested 10 days after vibration or at 80 days of age. It was suggested that rats vibrated from 1 to 21 days of age developed a greater capacity to tolerate noxious stimulation. The period from 1 to 21 days of age also appears to be one in which rats are most susceptible to influences of their non-social environment.
- 3) The consistently lower time scores of the vibrated animals in running the maze suggested that these subjects were less emotional. It was hypothesized that previous experience with the stress produced by a long period of exposure to vibration may have raised the experimental animals' threshold for later stresses, such as that produced by the U-maze test.
- 4) During a 30-minute period of extinction for food in a Skinner box, previously vibrated animals made more bar presses that produced vibration than controls. The difference was not significant at the .05 level. It was suggested that experimental animals made more bar presses because of their greater tolerance for vibration, rather than because vibration *per se* was more reinforcing for them.

Microfilm \$2.50; Xerox \$4.80. 95 pages.

AN ITEM FACTOR ANALYSIS OF SOME VALUE DIMENSIONS AND THEIR RELATION TO A MEASURE OF SUCCESS IN STUDENT NURSE TRAINING

(L. C. Card No. Mic 60-797)

John Craig South, Ph.D.
The Ohio State University, 1959

The purpose of this study was the discovery of some value dimensions characteristic of student nurses. An attempt was made to employ an open-ended approach in an effort to avoid predetermination of values and to increase the probability of drawing out any dimensions (or

factors) which might be present. A large number of items was used to further this aim. The methodological approach of factor analysis of items was employed.

In an attempt to avoid some of the semantic problems an operational definition of "value" was utilized. Values were defined as judgments in terms of "poor" to "excellent" on a nine-point continuum of a specific act, action or implied action.

Three schools of nursing with markedly different orientations were involved in the collection of all data, since different settings may tend to influence the "values" of student nurses. One hundred and thirty-four student nurses composed the study sample. The three levels of training of each school were approximately equally represented.

Although it would have been possible to study a value structure without some form of criterion, it was felt that relating any value dimensions obtained to some measure of success would have practical as well as theoretical implications.

The study data were collected in two forms: (1) evaluative responses to 275 items obtained from essays and interviews and (2) peer nominations of the "best" and "poorest" student nurses. The criterion data proved to be sufficiently reliable to be used. Subtests were developed from a number of the items and were subjected to two item analyses. The subtests in final form were intercorrelated and factor analyzed.

A total of seven factors emerged. After rotation six were retained and identified. Four were named: Acceptance and Compliance; Calm Assurance vs. Frightened Bewilderment; Concern for Self; Independence vs. Dependence. The two remaining factors consisted of a General factor and an unidentified factor suggesting emotional instability.

Coefficients of correlation were computed between the subtests and the criterion and between the factors obtained and the criterion. All correlations were low and not significant. Several possible explanations for the lack of correlation of the study variables and the criterion are suggested: (1) The peer nominations may have been made primarily on the basis of grades. (2) Perhaps there were value dimensions related to the criterion measure that were not tapped. (3) A disparity may have existed between the expressed and the true values. (4) There may have been no correlation between the study variables and the criterion.

Microfilm \$2.50; Xerox \$3.80. 67 pages.

SOME EFFECTS OF EXECUTIVE CLIMATE ON THE JOB PERFORMANCE, TRAINING ACTIVITIES, AND PROMOTABILITY OF INTERMEDIATE LEVELS OF MANAGEMENT.

(L. C. Card No. Mic 59-6805)

Lester F. Zerfoss, Ed.D.

The Pennsylvania State University, 1959

A Statement of the Major Problem

The purpose of this study has been to analyze and interpret some of the effects of executive climate of American Enka Corporation on-the-job performance, training activities, and promotability of intermediate levels of management from 1954 through 1956 inclusively.

The analysis was based on records of personality and

performance ratings of individual managers by their supervisors. Performance appraisals were studied to determine any factors or conditions in the executive climate that might be significant in either aiding or retarding the development and progression of managerial personnel at the intermediate levels below the top management group.

In addition to the appraisals of work performance, individual psychological evaluations were studied to classify each manager in terms of his leadership characteristics as related to work-centeredness or employee-centeredness.

Conclusions

1. A company can measurably increase the number of its promotable managers. A systematic plan for their training and personal development is very likely a contributing factor.

2. The kind of supervisory leadership a man works under will importantly affect his developmental progress.

3. An employee-centered executive climate will be more conducive to the growth and development of managers at lower levels than a work-centered executive climate will be.

4. The kind and the amount of training a manager receives, as well as the conditions under which the training is given, will have important effects on his progress.

5. A climate which provides opportunities to utilize newly developed skills is more conducive to continuing growth than is a static climate not providing such utilization.

6. Managers whose subordinates are developing will themselves develop.

7. The perception of a subordinate as a high performer on his present job will increase that subordinate's likelihood of receiving a promotion.

Recommendations

For a company's optimum use of all of the developmental resources available, both line and staff, the following 12 recommendations were made: (1) assist the individual to identify his development needs for improved job performance and realization of his potential; (2) assist the individual to plan his own improvement and growth program; (3) provide opportunities for on-the-job development by means of interpreted experience, growth delegation, special assignments, performance critiques, staff meetings, and chain conferences; (4) assist the individual to plan his further development through off-the-job training resources; (5) provide psychological counseling for self-development; (6) exercise more meaningful use of close-to-the-job group training activities; (7) broaden company experience; (8) provide greater utilization; (9) increase opportunities for educational courses by schools and colleges; (10) provide opportunities to attend management seminars; (11) encourage professional activities; and (12) encourage community leadership activities.

The basic philosophy behind these recommendations is that the direction and guidance of a man's boss is an integral part and, in fact, constitutes the greater part of an individual's training and development. At the point where the company's internal resources are inadequate, the boss should make available to the individual the educational and professional resources which may be found outside the company.

As the writer analyzed the more empirical implications in this study for further improvements in the company's

management development program, it became apparent that the company needed to take three steps to:

1. Obtain greater integration of its staff and line training activities.
2. Educate both the individual manager and his boss to realize that development is a team effort with reciprocal relationships, with mutual concerns, and with mutual advantages to each of them.
3. Bring clearly into focus throughout the management structure an awareness that the goals of the individual for his own development and progress and the goals of the company for becoming prosperous and profitable are wholly compatible and even identical.

Microfilm \$2.50; Xerox \$7.20. 153 pages.

PSYCHOLOGY, CLINICAL

THE RELATIONSHIP OF SELECTED PERSONALITY CHARACTERISTICS TO THE CHRONOLOGY OF THE MENSTRUAL CYCLE IN WOMEN

(L. C. Card No. Mic 59-6235)

Mary M. Anastasio, Ph.D.
New York University, 1959

Chairman: Professor Martha E. Rogers

The purpose of this study was to determine the relationship of certain personality characteristics and complaints to the chronology of the menstrual cycle. There were 604 women who cooperated in the study, but incomplete data and the desire to keep the factors of marital status, age, and length of cycle homogeneous reduced the study population to 428. These single women, students in a community college, ranged in age from 17 to 24 years. They were contacted twice: first, for orientation and for the establishment of menstrual records, and secondly, for the administration of the MMPI, a Census Data Sheet and a Complaint Check List. The date of administration of the latter materials constituted the time of the cycle (i.e., the time prior to menses).

Groups were formed on the basis of time to test administration during the menstrual cycle. The homogeneity of the thirty time cycle groups with regard to age, length of cycle and intelligence was determined by means of analyses of variance. Differences between the time cycle groups in fathers' birthplaces, socio-economic status and religion were analyzed by means of the Chi Square test. It was found that there were no significant differences between the time cycle groups for any of these factors, and that they were therefore homogeneous in this respect.

There were three hypotheses. One predicted that certain personality characteristics would vary in relationship to the chronology of the menstrual cycle. The relationship of the following personality characteristics to the chronology of the menstrual cycle was determined by analyses of variance.

1. Hypochondriasis
2. Depression
3. Hysteria

4. Psychopathic Deviate Behavior
5. Masculinity-Femininity
6. Paranoia
7. Psychasthenia
8. Schizophrenia
9. Social Interest
10. Hypomania

Another hypothesis predicted that the incidence and intensity of several physical and emotional complaints would vary as a function of the chronology of the menstrual cycle, becoming intensified premenstrually and menstrually. The incidence and intensity of the following complaints as related to the chronology of the menstrual cycle was evaluated by the Chi Square test.

1. Irritability
2. Headache
3. Mental Fatigue
4. Visual Fatigue
5. Depression
6. Excessive Hunger
7. Excessive Thirst
8. Breast Fullness
9. No Complaints

The third hypothesis was that the expression of selected personality characteristics and complaints varying within the menstrual cycle would not be differentially affected by the following factors, i.e., intelligence, socio-economic status, fathers' birthplaces, or religion. There was inspection of mean differences among groups in regard to each of the personality characteristics, as related to the various intellectual and social factors and the chronology of the cycle.

The results of this study indicate that, in a population of single, healthy, young women, there is likely to be no significant variability related to the chronology of the menstrual cycle for the following characteristics:

1. Specifically, Hypochondriasis, Depression, Hysteria, and Psychopathic Deviate Behavior were not exaggerated premenstrually, menstrually, nor postmenstrually.
2. Feminine interests did not show a peak premenstrually or postmenstrually, nor did they recede menstrually or intermenstrually.
3. Paranoia and Psychasthenia did not reach a peak premenstrually nor postmenstrually.
4. Schizophrenia did not increase premenstrually.
5. Hypomania did not reach a peak postmenstrually or premenstrually, nor does it decrease menstrually and intermenstrually.
6. There was no statistically significant variation in incidence and intensity of certain common complaints associated with the time of the menstrual cycle.
7. Lack of variability in the expression of certain personality characteristics and complaints related to the chronology of the menstrual cycle was not a function of fathers' birthplaces, socio-economic status, religion, or intelligence.

Microfilm \$3.05; Xerox \$10.80. 236 pages.

CLIENT EXPECTANCIES ABOUT COUNSELING IN A UNIVERSITY COUNSELING CENTER

(L. C. Card No. Mic 60-721)

Victor Harold Appel, Ph.D.
The Ohio State University, 1959

This study attempted to examine the expectations of 30 clients seen at the University Counseling and Testing Center of The Ohio State University, during the Winter Quarter, 1959. The study was concerned with five general questions. (1) What do clients expect of the counseling situation prior to being counseled at the University Counseling and Testing Center? (2) Are Client expectancies related to client behavior in the counseling situation? (3) Do client expectancies change over the period of counseling? In what directions? (4) To what degree are counselors aware of client expectancies for counseling? (5) How are a counselor's image of the expectancies and behavior of an "ideal" client related to the expectancies and behavior of his actual clients? From these questions eight hypotheses were derived.

Client expectancies, client behavior, counselor ratings of client expectancies, and counselor's "ideal" client expectancies served as four "perceptual vantage points" from which the study was considered. Taken two at a time, fourteen relationships between these vantage points were examined. Cattell's Coefficient of Pattern Similarity (r_p) was used to derive the relationship between the two vantage points being considered.

Comparisons were based on the similarity of response patterns of ratings made on the appropriate rating scale(s) at one of the three stages in the counseling contact. The scales included the Student Expectation Scales, Counselor Evaluation Scales, and the Judges' Rating Scales.

When the hypotheses were tested, the results indicated that—

1. The differences between clients' initial expectancies and those of counselors' "ideal" clients were not significant.
2. Prior client expectancies were not usable as predictors of client behavior in the subsequent interview.
3. Initial client expectancies did undergo significant change over the period of counseling.
4. Prior counselor ratings of client expectancies were not usable as predictors of client behavior in the subsequent interview.
5. Counselor ratings of client expectancies did not improve significantly in congruence with clients' own ratings of their expectancies from Stage 1 to Stage 3.
6. There were no significant differences among counselors in the degree of congruence of counselor ratings of client expectancies with clients' ratings.
7. The greatest degree of change in client expectancies and behavior did occur in those clients whose initial expectancies were most discrepant from those of their counselors' "ideal" clients.
8. The congruence of client expectancies and counselor ratings of client expectancies did improve as initial client expectancies and counselor "ideal" client expectancies increased in congruence.

It was concluded that the construct of "expectancy" was a useful one in assessing short-term counseling in a university counseling center. When the expectancies of clients of the UCTC were examined, they were found to be relatively congruent with those that counselors would want

their clients to hold. Thus, it appeared that the UCTC had succeeded in communicating to students "appropriate" expectancies for counseling. Finally, recommendations for further research were offered.

Microfilm \$2.65; Xerox \$9.25. 203 pages.

INTERPERSONAL PERCEPTIONS AND EMPATHY IN AN INDUSTRIAL PROBLEM SOLVING GROUP

(L. C. Card No. Mic 59-6936)

Kenneth Leon Ball, Ph.D.
Washington University, 1959

Chairman: Hyman Meltzer

The study investigated the relationship between certain specified "psycho-social" perceptual variables and empathy, and between empathy and adequate problem solving in an industrial setting. The psycho-social variables measured were: (a) feeling tone; (b) affective perception; (c) verbal anxiety; (d) social distance; (e) identification; and (f) Dymond empathy, employed to measure accuracy in judging trait characteristics. Empathy was defined in this study as accuracy in judging feelings during problem solving. The three criteria measures of effective problem solving were adequacy of solutions, the Bales formula for directiveness of control, and predominance of positive communications.

The setting was a medium sized industrial plant, and the subjects were eleven supervisors comprising a stable, interdependently functioning group. The variables were investigated intensively and as they occurred in action in an effort to understand their manifestations in group behavior.

Subjects were interviewed in open ended fashion and sociometric questionnaires were employed. The subjects were divided into two matched groups with four dyads in each. Each dyad attempted to solve five problems, relevant to the entire group of subjects. Each subject then rated on an eleven point scale at predetermined and signaled intervals how satisfied the other subject was with what was being discussed and how satisfied he was with what was being discussed, as the sessions were replayed on a tape recorder.

Transcriptions of the problem solving interactions were rated by the Bales interaction analyses technique. The content from each of the discussions was abstracted and submitted to the three top executives in the company for rating adequacy of solutions.

The specific hypotheses examined were: (a) The psycho-social variables taken along continua from creating perceptual barriers to facilitating social perceptions are significantly and positively related to accuracy in judging the feelings of others during the action of problem solving; and (b) Accuracy in judging the feelings of others during the action of problem solving is significantly related to adequacy of problem solving.

The results indicated that within the group considered all of the psycho-social variables are significantly related to each other. Dymond empathy is inversely related to anxiety, and directly related to feelings of social closeness. Empathy in action is inversely related to affective

perception and Dymond empathy, and directly related to positive feeling tone. The relationship between empathy in action and adequate problem solving was significant and inverse. Findings associated with empathy in action indicated that such factors as lability versus restricted ratings of one's own feelings, security feelings, and stereotyping should be considered when investigating the process of empathy. Microfilm \$2.50; Xerox \$5.40. 109 pages.

AN INVESTIGATION OF THE ROLE OF THE
GROUP THERAPIST AS A DETERMINER
OF THE VERBAL BEHAVIOR OF
SCHIZOPHRENIC PATIENTS

(L. C. Card No. Mic 60-630)

Jack Basham, Ph.D.
University of Kentucky, 1955

Supervisors: Dr. Graham B. Dimmick
Dr. Richard L. Blanton

The objectives of this study are twofold: (1) to demonstrate a technique for equating groups of chronic schizophrenic patients on the basis of their verbal performance in groups, and (2) to demonstrate the relationship between the verbal behavior of the therapist and that of the patients. This study was not concerned with movement or improvement of the patient as a function of the two verbal techniques.

The following procedures were followed:

1. Thirty chronic schizophrenic patients were selected from 85 who lived in the same ward, on the basis of their placement on a 5-point Estimation of Availability Scale. Three matching groups of ten each were formed.
2. Five 50-minute, electrically recorded, group psychotherapy matching sessions were held for each group by the same therapist.
3. Two experimental groups of ten each were formed on the basis of an analysis of the data secured. These were equated as closely as possible on two aspects of behavior: (1) a word count of the total number of words spoken by each, and (2) the number of verbal statements or acts in the scoring categories of the modified Bales' system. The groups were also matched on the incidental factors of mean age in years, age range in years and mean years of education.
4. Two well-defined verbal techniques were formulated for use in the two experimental groups. Group (O) was conducted so as to use opinion statements. Group (R) was conducted so as to enable the therapist to use statements of reflection, of content and feeling. These groups met four times a week for thirty-four 50-minute group therapy sessions, all electrically recorded.

Data secured from thirty sessions for both Groups (O) and (R) were analyzed as to the performance of the therapist and patients. Not only were the data analyzed in order to test the relationships, if any, between the verbal behavior of the therapist and that of the patients in terms of types of verbal statements, but analysis was made as to the stability of patient performance over periods of time in four meaningful classes of categories (Positive Reactions, Attempted Answers, Questions and Negative Re-

actions) as well as Psychotic Reactions, Patient Interaction and Group Laughter. The stability of the therapist's performance in each group over periods of time was evaluated in terms of the first four classes of statements. Reliability checks of the writer's scoring of the material taken directly from the records were made by comparing his scoring of 1,434 verbal acts with the scoring of one trained and one untrained judge. Percentages of agreement in the 80's were obtained.

It was found that marked relationships existed between the category activity of the therapist and patients of each group. The relationship between the therapist and patients of each group was found to be significant far beyond the 1% level of confidence.

In this study the question of group comparability was answered by an effective matching technique. The issue of therapist comparability, insofar as undefined variables of personality are concerned, was settled by the use of one therapist in two different but well-defined roles. Under these controlled conditions it was shown that within limits apparently set by the nature of verbal interaction itself, marked differences in group behavior occurred and that these differences were attributable to the differing classes of statements consciously employed by the therapist. The findings compare closely with those of other investigators. This suggests the operation of "laws" of verbal interaction which should be tested through the use of other systems of categories and other types of patients. His findings also point to the possibility of controlling the verbal behavior of the patient through the use of specific kinds of therapist activity. Microfilm \$2.50; Xerox \$6.80. 145 pages.

THE RELATIONSHIP BETWEEN ACCURACY IN
SELF PERCEPTION AND THE PERCEPTION
OF OTHERS: A STUDY OF ESTIMATES OF
PERFORMANCE ON A TEST OF VALUES AND
A TEST OF ASPIRATION LEVEL.

(L. C. Card No. Mic 59-6995)

Robert Louis Belenky, Ph.D.
Columbia University, 1959

The single hypothesis of the present investigation was that accuracy in self-perception is positively correlated with accuracy in the perception of others. The hypothesis was considered confirmed only under the condition of control for factors such as intelligence, tendency to perceive others in terms of a stereotyped notion of the group norms, and tendency to assume similarity between self and others. Other influences investigated were: degree of judge's acquaintance with target, and the degree to which the judge liked and was liked by the targets. Finally the degree to which the relationship between self-predictive accuracy and accuracy in predicting for others held over tasks as well as targets was studied.

The Ss were 89 male college students who were resident members of fraternities or similar organizations. They were tested in groups of seven to nine men each.

Two basic instruments and predictive tasks were used. On one instrument, the Allport Vernon Study of Values, the six value scores were ranked for each S. The ranked scores were used as the prediction criterion for that S.

The Ss were then required to predict their own scores and the scores of the others in their subgroup. The perception of others score was the mean of the rank order correlation coefficients for each S's predictions over his six to eight targets. The self-perception score was the rank order correlation coefficient between the self-prediction and the criterion.

The other major instrument was a level of aspiration test. The self-perception score was a measure of the closeness between goal and performance for each S. In order to measure perception of others, a method was devised whereby each S ranked all others within his group with respect to a single variable: the degree to which their goals were greater or less than their performance. The perception of others score was the rank order correlation coefficient between the predicted and the actual rankings.

Additional measures included: two measures of the judge's tendency to stereotype others; a measure of the degree to which each judge viewed others as similar to himself; a measure of the extent to which they were similar to him; a measure of the degree to which he liked his targets; a measure of the degree to which his targets liked him; and finally a measure of each judge's intelligence.

No evidence was found to support the hypothesis that the ability to perceive the self accurately is positively related to the ability to perceive others accurately. Although a positive correlation was found through use of the scores derived from the Study of Values, judges were so inconsistent in their accuracy scores on the perception of others variable that the positive relationship had to be considered a Type I error. It was concluded that in the present investigation ability to judge self and ability to judge others were not related. Furthermore, perceptual sets and other secondary variables were independent of both perception of self and perception of others.

The present findings were evaluated and related to previous investigations. Since it appeared that accuracy in judging others was a function both of the task used and the persons predicted for, it was felt that the major concern of interpersonal research should be that of developing relevant tasks and determining the conditions under which consistent accuracy over targets may be obtained.

Microfilm \$2.50; Xerox \$4.60. 90 pages.

AN INVESTIGATION OF SOME RELATIONSHIPS BETWEEN CONDITIONING, TASK PERFORMANCE, AND ANXIETY.

(L. C. Card No. Mic 60-636)

Louis Brown, Ph.D.
University of Kentucky, 1954

Supervisor: Dr. James S. Calvin

The present investigation was concerned with the empirical testing of the relationship between eyeblink conditioning and performance in two series of tasks, comprised of four card-sorting matching tasks and two associative learning tasks, each graduated in complexity or difficulty. Thirty-six hospitalized neuropsychiatric patients served as subjects. In addition to executing this aim, data were collected on the "anxiety" ratings of the same subjects

(utilizing what has become known as the Taylor Manifest Anxiety Scale). This provided an opportunity for evaluating three further relationships: the correlation between amount of conditioning and Taylor Anxiety score; the relation between Taylor score and task performance; and the relation between a combined conditioning-Taylor score rating and task performance.

In pursuing the aim of this investigation, a standard electroencephalograph apparatus was adapted for use in eyeblink conditioning; and a method for utilizing card-sorting tasks varying in difficulty was presented.

The following results were found in this study:

1. A relationship between performance in conditioning and matching tasks was evident. This did not appear to be rectilinear, as anticipated; but exhibited a curvilinear trend, such that moderate conditioners were superior performers in all the matching tasks throughout the range of difficulty. The inferior task performances of those Ss at either high or low extreme quarters in conditioning more closely resembled each other. On the assumption that defense conditioning may be some measure of "reactivity" or anxiety, these results were discussed in terms of the existence of a critical point beyond which poorer performance results.

2. No clear relation between level of conditioning and performance in associative learning was discovered. It was suggested that this may have been due to an uncontrolled intellectual factor.

3. The same general findings as presented above were found between the Taylor Anxiety Scale and task performance. The need for more information regarding the meaning of this scale, especially with reference to depression, was indicated. It was suggested that further study of correlated with conditioning would be of value.

4. Contrary to the findings of other investigators, a negative correlation between conditioning and the Taylor Scale was discovered in this study. The problem of using this scale to separate psychiatric patients as to degree of anxiety was considered.

5. It was anticipated that Ss scoring high on conditioning would display relatively superior performance to low conditioners in the less difficult tasks, and that this difference would progressively reduce as the matching and associative learning tasks became more difficult, until the lower conditioners were superior on the most complex task or tasks. The same progressive change was expected for high and low scorers on the Taylor Scale. In neither case was this fully substantiated; however, Ss scoring in the first and second quarter of conditioning did display this relative relationship and progressive change.

6. A combination of conditioning-Taylor score rating of the Ss appeared to be more critical in separating Ss in matching task performances. Those Ss who were moderate on both measures tended to be superior in the tasks to those who scored in the extremes of one or both of these measures. Microfilm \$2.50; Xerox \$4.20. 76 pages.

THE PREDICTIVE UTILITY OF THREE DELINQUENCY PRONENESS MEASURES

(L. C. Card No. Mic 60-812)

Sam D. Clements, Ph.D.
University of Houston, 1960

The impetus for this study stemmed from the recognition that one approach to delinquency prevention requires the early identification of children predisposed to delinquency. Two instruments devised by Kvaraceus, the Delinquency Proneness Scale and the Delinquency Proneness Check List, were used along with a five-point Global Rating Scale to evaluate the efficacy of employing brief screening devices to detect the delinquency prone. In addition to assessing relationships among these three measures, their efficiency was evaluated in differentiating those children who after a three year follow up had become juvenile offenders. The Junior Personality Quiz and Rogers Test of Personality Adjustment were selected to explore the personality correlates of delinquency proneness. Further aspects of the study were to provide additional normative data on the two Kvaraceus' measures and to contrast these with comparable studies.

The sample was composed of 219 white males, 257 white females, 27 Negro males, and 41 Negro females. All were drawn from sixth grade classes in twelve elementary schools in Wichita, Kansas. The Negro sample was an ancillary inclusion and was discussed only in the initial group comparisons.

All subjects were administered the Delinquency Proneness Scale and were assessed on the Delinquency Proneness Check List by their teachers, who also rated them on the Global Rating Scale. The personality measures were administered to 82 white males and 98 white females from which 41 males and 49 females were randomly assigned to a cross-validation group.

Three years following the initial testing, the Juvenile Division records of the Wichita Police Department were made available and notations concerning juvenile offenses committed by any child in the study were cataloged. These children in the study were referred to as the offenders.

The three delinquency proneness measures were inter-correlated; sex and race differences were obtained on these three measures; and mean Delinquency Proneness Scale scores on this and other studies were contrasted.

Correlations were obtained between the Delinquency Proneness Scale scores and the twelve Junior Personality Quiz factors and the five scores of the Rogers Test of Personality Adjustment. Those factors on which correlations approached significance in the preliminary group were retained for analysis in the cross-validation group.

The scores on the three delinquency proneness measures for the white male offenders were compared with the scores of the white male non-offenders. These white male offenders were then matched on the Delinquency Proneness Scale score with white male non-offenders and differences in personality scores were evaluated. Sex, race, and seasonal comparisons were made on the incidences of offenses.

The associations among the three delinquency proneness measures were direct but in general were sufficiently low to permit their use as independent instruments.

On the Delinquency Proneness Scale and the Delinquency Proneness Check List, Negro children scored significantly

higher than white children. On the Delinquency Proneness Scale, white females scored higher than white males, in opposition to the trend in other studies.

On the Delinquency Proneness Check List, white females scored lower than white males.

Females of both races scored lower than males on the Global Rating Scale.

In comparison with a combined group of seventh, eighth, and ninth grade children, the males in the present study scored significantly lower on the Delinquency Proneness Scale than males in this older group, contrary to the reported decrease in Delinquency Proneness Scale score with increased school grade. For the females, the reverse obtained. The actual score differences were too slight to have any practical effect upon the comparability.

On the cross-validation between the Delinquency Proneness Scale and the Junior Personality Quiz, there was a low association ($p < .05$) between delinquency proneness and "dislike of education" for the male sample. For the female sample, there was a moderate association ($p < .005$) between "emotional sensitivity" and delinquency proneness. A moderate relationship ($p < .005$) was found for females between "personal inferiority" and delinquency proneness on the Rogers Test of Personality Adjustment.

There was a higher percentage of Negro than white offenders regardless of sex. The higher percentage of male offenders regardless of race in this study is in accord with the national sex ratio of five male to one female offenders. There was a dramatic decrease in the incidences of offenses during the summer months. The difference between offenders and non-offenders was significant in the expected direction on the Delinquency Proneness Check List ($p < .025$) and the Global Rating Scale ($p < .025$). When the Delinquency Proneness Scale score was held constant, the male non-offenders were characterized by such personality traits as "more sociable," "easy-going," "warm-hearted," "dominant," and "competitive," while male offenders were characterized as "rather rigid," "disliking groups," less "dominant," and less "competitive."

In summary, the three delinquency proneness measures employed in this study were positively related but their relationships were of a low order. The distributions of the delinquency measures in the study were equivalent to those reported by other investigators. Males of both races and Negroes of both sexes tended to score higher on the delinquency proneness measures. The predictive utility of the three delinquency proneness measures in discriminating those youngsters who eventually did commit offenses was too low to have practical significance. The difficulty in establishing a behavioral criterion for "delinquency" which would include a large number of non-apprehended offenses in the supposedly non-offender group, is a major obstacle in evaluating the "true" usefulness of these measures. If one assumes that the Delinquency Proneness Scale does measure proneness to delinquency, the personality studies and indirectly the decline in offenses during the summer months, indicates that school problems present the most difficulty to the delinquency prone males. The delinquency prone females have difficulties focused in feelings of insecurity, inferiority, and inadequacy.

Microfilm \$2.50; Xerox \$6.00. 122 pages.

AN INVESTIGATION OF THE RELATIONSHIP
BETWEEN A PRIMARY IRRELEVANT DRIVE
AND PERFORMANCE ON SIMPLE AND
COMPLEX TASKS

(L. C. Card No. Mic 60-646)

John Eisele Davis Jr., Ph.D.
University of Kentucky, 1955

Supervisor: Dr. Graham B. Dimmick

Within recent years there have been an increasing number of attempts to bring about an integration between the phenomena, concepts and theories found in the clinical area of psychology and those found in the more traditional areas. Particularly has there been great interest in the clinical concept of anxiety as it relates to learning. It is in respect to this relationship that the present study had its genesis.

Recent studies on anxiety have reported data which have been interpreted as supporting the assumption that total effective drive level, as measured by certain aspects of performance, is determined by "irrelevant needs" which are not themselves reduced by the performance under consideration. Anxiety, as measured by a questionnaire, has been assumed to be an irrelevant drive, contributing to the total drive level and increasing the strength of all responses. Depending upon the complexity of the task, this increase in response strength has been assumed to have a differential effect upon performance--enhancing performance on simple tasks and causing a decrement in the performance of complex tasks.

Aside from the studies on anxiety, there is no evidence that irrelevant needs do have this differential effect upon performance as a function of the complexity of the task. It was hypothesized that if anxiety were an irrelevant drive, then other known irrelevant drives would have the same effect upon performance on simple and complex tasks. If "known" primary drives do not have this effect, then anxiety cannot be interpreted as an irrelevant drive.

Subjects with food deprivation periods of one (low hungry), twelve and nineteen hours (high hungry) were compared as to their performance in a classical conditioning situation and on a ten choice point stylus maze. The twelve hour group was included for the purpose of obtaining information concerning the functional relationship that may hold between an irrelevant hunger drive and performance.

It was predicted that the high hungry individuals would show an increment in performance on a conditioning task and a decrement in performance on a maze task when compared with low hungry individuals. The findings on the simple task (conditioning) were in keeping with the prediction. The high hungry individuals conditioned faster than did the low hungry; however, on the complex task (maze) the two groups did not differ in performance as measured by trials to criterion of learning or number of errors. As these latter results were not consistent with those found in the anxiety studies, it was concluded that anxiety cannot be considered as an irrelevant drive.

The findings concerning the functional relationship holding between hunger and performance on conditioning were not conclusive. The data suggested that a linear relationship may exist in trials to conditioning, but on trials to extinction a curvilinear one was indicated.

Alternative theoretical explanations regarding the effect of anxiety on performance were presented and an interpretation (incorporating the findings of the study) which involved the relationship between the internal state and its associated environmental stimuli was offered.

Microfilm \$2.50; Xerox \$5.00. 100 pages.

SENSITIVITY OF SCHIZOPHRENICS
TO PARENTAL CENSURE

(L. C. Card No. Mic 60-406)

Richard Marshall Dunham, Ph.D.
Duke University, 1959

Supervisor: Eliot H. Rodnick

This experiment tested the proposition that, compared to normals, schizophrenics with a poor premorbid social adjustment are more sensitive to maternal than paternal censure, while schizophrenics with a good premorbid social adjustment, though possibly generally less sensitive to censure, are relatively more sensitive to paternal than to maternal censure.

Four sets of slide pictures were shown to a group of psychiatric normals and to two groups of schizophrenics, one with good premorbid social adjustment and one with poor premorbid social adjustment. Each set contained six pictures which varied systematically in some spatial aspect that did not affect the meaning of the pictures. One scene depicted a mother scolding a boy and another, a father scolding the boy. Two presumably neutral scenes were included as controls for the censure scenes. Measures of each subject's accuracy in discriminating the variations of each series from its standard picture were obtained under conditions in which known sources of variance, such as age, intelligence, and order effects, were controlled. It was expected that excessive sensitivity to censure would be manifested in deficits in discrimination accuracy.

The schizophrenic group with good premorbid social adjustment was significantly less accurate than normals in discrimination only on the father-censure scene. Those with poor premorbid social adjustment showed deficits on the mother-censure scene and on both control scenes. Their largest deficit was on the mother-censure scene. The only scene on which they did not show significant deficit was the father-censure scene. When the two groups of schizophrenics were compared directly with one another, it was found that those with good premorbid social adjustment were less accurate than those with a poor premorbid social adjustment on the father-censure scene and that the reverse was true on the mother-censure scene.

The results were regarded as a confirmation of the hypothesis. There appeared to be two complicating factors, however, both reflected in the interaction of the accuracy of the groups on the themas with the subgroups that received different orders of themas. One complication was thought to be an intrinsic effect of the different orders; the other, an extrinsic effect of sampling error in the selection and assignment of subjects to subgroups.

Microfilm \$2.50; Xerox \$5.20. 103 pages.

WORK VALUES AND BACKGROUND FACTORS AS PREDICTORS OF WOMEN'S DESIRE TO WORK

(L. C. Card No. Mic 60-736)

Lorraine Dittrich Eyde, Ph.D.
The Ohio State University, 1959

This study was an attempt to assess the relationships between work values, background factors and women's work motivation. Predictors of Desire to Work were developed for two Jackson College classes: (1) the 1958 class, seniors at the time of the study; (2) the 1953 class, alumnae of five years.

A factor analysis of work value items by the Wherry-Winer method produced a general factor and six specific factors identified as the following work values: Dominance-recognition; Economic; Independence; Interesting activities-variety; Mastery-achievement; Social. From these, two forms of a work value scale were developed: a five point rating scale and a ranked scale.

A criterion measure of Desire to Work was based upon weighted self-estimations of work motivation under 17 postulated conditions relating to marital status, family size and income. On the basis of the criterion scores, each group was separated into upper and lower halves according to their Desire to Work. The response categories of each predictor variable were related to these criterion groups, and the difference tested by means of Chi square.

Approximately two-thirds of each class replied to a questionnaire. It was found that proportionately more variables predicted the work motivation of the alumnae than of the seniors. The alumnae were more certain of the extent of their work motivation and presumably gave a more valid estimate of their Desire to Work because of their greater work experience, their additional education and their greater understanding of the dual homemaker-career role.

Activity involvement was closely associated with work motivation for the seniors, but not related for the alumnae. It was felt that the seniors somehow associated activity involvement in college with a busy schedule of work and outside activities after graduation.

Lower middle class membership was related to a high Desire to Work among the alumnae, but was unrelated among the seniors. Also a desire for graduate school education was associated with high work motivation for the seniors; whereas the actual attainment of a graduate degree related to high Desire to Work for the alumnae.

Three variables relating to the homemaker-mother role met the standards of cross-validation, differentiating work motivation classifications for both samples. These variables concerned compromises in woman's traditional home-maker role that must be made if the woman is to work.

Considerations of minimum and adequate income of husband were related to work motivation. Alumnae and some seniors with high work motivation chose relatively lower salaries as minimum and adequate for their husbands.

More meaningful job-related variables were associated with the work motivation of the alumnae than of the seniors. For the alumnae, high work motivation was related to career interests, to the desire to work a greater number of years after marriage, and to the way husbands or others felt about their working.

Since the seniors had had little work experience it is

understandable that only one scale, the Ranked Dominance-Recognition Scale, showed a relationship to work motivation. This particular scale dealt with a value that described leadership-power relationships not too unlike those present in college leadership positions.

Alumnae with high work motivation assigned themselves rather "masculine" work values described in the Ranked Interesting-variety and Ranked Mastery-achievement Scales. The alumnae with a low level of work motivation chose "feminine" values elaborated in the Ranked Independence and Ranked Social Scales.

By developing and combining predictor weights from one class and applying them to another, it was possible to predict significantly the membership in the work motivation classifications. However, by using only the four best predictors from each class and applying them to another class, the level of prediction was further increased.

Microfilm \$2.95; Xerox \$10.35. 226 pages.

PREFERENCES AND DISLIKES OF NEUROPSYCHIATRIC PATIENTS AND NORMALS FOR THE FINGER PAINTINGS OF OTHER NEUROPSYCHIATRIC PATIENTS

(L. C. Card No. Mic 60-650)

John Harry Feamster, Jr., Ph.D.
University of Kentucky, 1950

Problem:

A study of the preferences and dislikes of neuropsychiatric patients and normals for the finger paintings of other neuropsychiatric patients.

Historical Development of the Problem

The purpose of this study has been to perform the most elementary and basic steps necessary to create a new diagnostic instrument. The proposed test in its final form will be classed as a projective technique.

Eight patients whose diagnoses corresponded to the eight disease factors of the Szondi test were asked to produce finger paintings. Each of the ten paintings was to represent a certain theme. The resulting paintings were divided into ten series of eight pictures, each series representing one theme by a different patient-artist.

Three groups of twenty subjects each (paranoid schizophrenics, epileptics, and "normals") were presented with one series at a time and asked to choose the two paintings they liked the most; then they were asked to pick the two they disliked the most. Verbalizations were recorded. The Szondi test was administered one time to the first ten subjects of each group.

The possible effects of color and artistic quality of paintings upon the choices of the various groups were discussed. The Szondi profiles of the first ten subjects of each group were compared to the similarly constructed experimental profiles of the same subjects. A scoring key was constructed, based upon the choices of the sixty subjects. Individual protocols were scored, and the groups were differentiated on the basis of these scores. Tendencies established among the three groups during the testing of the first ten subjects of each were subjected to the Chi Square test to determine whether these tendencies

continued to hold among the three groups when the second ten subjects of each group were tested. Pictures appearing in the scoring key, and subjects' verbalizations were discussed.

Some of the major results of this study are as follows:

Color

(a) Psychotic subjects tend to choose pictures painted in the brighter colors yellow and red more often than do the "normal" subjects.

(b) Epileptic patients chose pictures colored green more often than the other two groups.

(c) Normal subjects seem more free in their ability to accept a range of different colors.

Artistic Quality of Paintings

(a) The artistic quality of paintings has a marked influence upon the choices of all groups.

The Szondi Test

The Szondi profiles of subjects, when compared with their experimental profiles using the coefficient of profile similarity (7), were similar no more often than would occur by chance.

The Scoring System

By assigning weighted scores to certain pictures, a scoring key was devised which differentiated between Paranoid Schizophrenics, Epileptics, and "Normals" (twenty subjects in each group) at the 1% level of confidence.

The Chi Square Test

The Chi Square test of the consistency of tendencies established among the first ten subjects of each group when compared to the second ten, strongly suggest that the three groups of subjects do have differential reactions to finger paintings on some basis other than chance.

Verbalizations

(a) Completed finger paintings may be used effectively as stimuli for projective material.

(b) Patients' descriptions of a painting may be much the same, while the emotional reaction of the two individuals toward this picture may be quite different.

(c) Subjects are apt to rationalize their choices, even when asked about them in the most undirected way.

(d) Psychotic subjects tend to differ from "normals" in that they often speak symbolically without being aware of doing so. Normal subjects usually imply by word or expression that they are aware of speaking symbolically.

Microfilm \$2.50; Xerox \$6.00. 124 pages.

INTRA-INDIVIDUAL VARIABILITY IN THE SCHIZOPHRENIC PSYCHOSES

(L. C. Card No. Mic 60-60)

Brenda Katz Goodrick, Ph.D.
Washington University, 1959

Chairman: John A. Stern

This study was primarily concerned with the relationship between schizophrenia and variability which is a generalized characteristic of the individual. It was predicted that the schizophrenic subjects would be more

intra-individually variable on all but a simple sensory task. Additionally, the relation between behavior pathology and intra-individual variability was investigated. The poorer emotional adjustment of the schizophrenic group was also studied.

The subjects were thirty schizophrenic and thirty non-psychiatric Veteran Administration Hospital patients. The subjects were seen at two testing sessions with an interval of one week between sessions. A five minute record of the subjects' pulse and respiration rate was made at the beginning and end of each session. Depth perception was the sensory test used. A Defense Inquiry (devised by the experimenter) and an Associate Learning task were the psychological tests. At each session the subjects were also rated from an interview on the Symptom Rating Sheet to estimate the degree of behavior pathology present.

The present study was designed to test the following hypotheses:

1. Schizophrenic patients show more intra-individual variability on psychological and physiological variables than nonpsychiatric patients.

2. Intra-individual variability is positively related to degree of behavior pathology.

3. Schizophrenic patients are not more intra-individually variable than nonpsychiatric patients in a simple sensory task.

4. Schizophrenic patients do not "adjust" to the testing situation as well as nonpsychiatric patients, i.e., they will not decrease in their emotional responses as will non-psychiatric patients, both during one session and from session to session. This will be shown by their failure to decrease in the rate of physiological indices of emotional response.

The absolute difference between the scores of the two sessions was the measure of intra-individual variability used. To determine the intra-individual variability and emotional "adjustment", a T^2 test was computed. The T^2 test is a method of testing the overall differences between the means of three or more measures, which takes into consideration the correlations between the measures. It was found that the schizophrenic group was more intra-individually variable than the control group, but the differences did not reach statistical significance. Moreover, although pathology was correlated positively with intra-individual variability for both groups, the correlations were not statistically significant. As predicted, the sensory threshold of the schizophrenic group was not more intra-individually variable than the control group's.

The emotional reactions, as measured by physiological indices, of both the schizophrenic and control groups, decreased during the period of an individual session; but as predicted, the schizophrenic group increased in emotionality, or adjusted emotionally more poorly than the control group, from one session to another. The differences were not statistically significant, however.

The fact that only trends in the predicted direction were obtained was considered to be determined by the nature of the schizophrenic sample used in the study. Despite suggestions in the literature to the contrary, it was concluded that a schizophrenic sample which consisted of more process schizophrenic patients, rather than the reactive schizophrenic group used in the present study, would show more intra-individual variability.

The author reviews speculations on the causes for intra-individual variability in schizophrenia. The poorer

cooperation of schizophrenic subjects is often viewed as the causal factor, but evidence is presented for the opinion that a more general basic view which considers the personality and physiological substrate would be a more adequate explanation. It was further suggested that a delineation of schizophrenia into reactive and process subtypes holds promise for a more meaningful classification system. Microfilm \$2.50; Xerox \$4.20. 78 pages.

**REFERENCE GROUP IDENTIFICATION
AS A VARIABLE IN CONVALESCENCE AND
CHRONICITY OF MENTAL HOSPITAL PATIENTS**

(L. C. Card No. Mic 59-6355)

Henry Oliver Gwaltney, Jr., Ed.D.
University of Missouri, 1959

Supervisor: John F. McGowan, Ed.D.

This study was designed as a preliminary investigation of the variable of reference group identification in "convalescent" and "hospital adjusted" chronic state mental hospital patients. These are two of the groups with whom the vocational rehabilitation counselor must be primarily concerned. It is particularly important to add to our understanding of the differential characteristics of these patients at this time as vocational rehabilitation services to psychiatric patients under the State-Federal Program are in the process of rapid expansion and new knowledge is needed to aid the counselor in his work. Previous behavioral observations and theoretical assumptions indicated differences between these two populations which we would expect to be important in rehabilitation case services.

Thirty-one male patients who had been hospitalized less than one year and were to be released from the hospital in the near future were the sample for the "Convalescent" Group. The "hospital adjusted" Chronic Group consisted of thirty-three patients on the Continued Treatment or chronic wards, who had been hospitalized for over two years, and appeared behaviorally to be adjusted to the hospital. Each of these chronic patients was working in some hospital industry. Patients in both groups had the minimum of a eighth grade education, were born after 1900, and had a diagnosis of a functional psychosis.

The subjects were administered a semantic differential designed specifically for personality-type concepts. Each of the subjects rated the following self-related concepts: (a) Actual Self; (b) Ideal Self; and (c) Expected Self. The following group related concepts were rated: (a) Employed Men Outside of the Hospital, and (b) Chronic Patients. Identification was defined as the degree of similarity between each self-related concept and each group related concept. Any findings must be interpreted within the limitations of the definition of identification as this similarity of semantic differential profiles and any unrepresentativeness of the samples.

As predicted, the Convalescent Group "identified" more with the non-hospital reference group (employed men) than with the patient population. This was based on the findings that the Convalescent group rated the self-related concepts as closer to the extra-hospital concept (employed men) than to the concept of the patient population. The prediction

was also made that the hospital adjusted chronic patients would identify more with the patient reference group than with the employed people group. This hypothesis was rejected as they identified, as far as their Actual Self and Expected Self concepts were concerned, as much with employed people as with the patient population, and ideally, as presented in the concept Ideal Self, they most want to be more like people outside of the hospital. This was based on the findings that the Chronic Group rated concepts of Actual Self and Expected Self as close to the concept of Employed Men as to the patient concept, but rated the concept of Ideal Self as closer to the extra hospital concept of Employed Men than to the concept of Chronic Patients. Microfilm \$2.50; Xerox \$6.40. 134 pages.

**IDEATIONAL AND MOTOR CORRELATES OF
THE RORSCHACH EXPERIENCE TYPE**

(L. C. Card No. Mic 60-501)

Jack L. Herman, Ph.D.
New York University, 1957

Adviser: Isidor Chein

The purpose of this study was to investigate some of the motor and ideational correlates of the Rorschach experience type, as represented by the ratio of M : sum C, and to integrate the Rorschach experience type concept with relevant psychological and psychoanalytic theory. In addition, various other Rorschach components, hypothetically related to the experience type, in the form of a Rorschach composite weighted score, were explored for their relationships with motor and ideational criteria.

On the basis of Rorschach and relevant psychological theory, it was hypothesized that Rorschach introversives would show greater motor inhibition and ideational productivity, and less gestural-motor expression and need-for-motor activity than Rorschach extratensives. The same relationships were predicted for subjects with high Rorschach composite weighted scores versus subjects with low composite weighted scores.

The motor and ideational criteria consisted of a slow writing task (motor inhibition), a modified TAT, scored for the amount of transcendent ideational content included in "describing" the pictures (ideational productivity), a list of words to define, scored for the number of words on which expressive gestures were evoked (gestural-motor expression), and a questionnaire on need-for-motor activity.

The subjects were a mixed group of psychiatric and general medical patients. There were 64 subjects; 32 in each group. Subjects who gave 2 or more M than sum C on an individual Rorschach were classified as introversives. Subjects who gave 2 or more sum C than M were classified as extratensives. The groups were found to be equated on relevant variables, including mean number of Rorschach responses.

All the hypotheses were supported by the data, except for the need-for-motor-activity criterion, which failed to significantly differentiate introversives from extratensives, and high Rorschach composite weighted scores from low composite weighted scores.

The Rorschach composite weighted score and the experience balance were found to be relatively highly correlated, due to significant difference between the groups on seven of the ten indices making up the composite weighted score. Hence, the results for the composite weighted score paralleled those for the experience balance in relation to the criteria. The question therefore arose whether the results for the composite weighted score are artifacts. The results of a statistical analysis of this question were not clear-cut, and it was left open for further study.

The results were discussed in terms of Werner and Wapner's sensory-tonic theory of perception, which postulates an inverse and reciprocal relationship between apparent movement and overt motility; and in terms of the Freudian theory of thinking, which similarly conceives of ideation and motility as inversely and reciprocally related.

The conclusions were:

1. The Rorschach experience type is a tenable concept in terms of motor and ideational correlates.
2. Various other Rorschach components hypothetically related to the experience type, in terms of a composite weighted score, appear also to be related to the experience type concept. However, the question of the independence of these components from the experience balance remains open.
3. The findings are consistent with relevant psychological and psychoanalytic theory, and suggest that the Rorschach experience type concept may provide a bridge between these apparently divergent theories. At the same time, if the Rorschach protocol is viewed as a function of ego processes, then the Rorschach technique may be very useful in the development of a more inclusive theory of behavior and personality.
4. By noting the congruence of the Rorschach experience type concept with other more general and acceptable concepts, Rorschach interpretations acquire greater meaningfulness and communicability.
5. The results provide additional evidence of the feasibility and desirability of subjecting the Rorschach technique to experimental study.

Microfilm \$2.50; Xerox \$7.60. 161 pages.

PURSUIT-ROTOR PERFORMANCE IN THE BRAIN-DAMAGED: THE ROLE OF REACTIVE AND CONDITIONED INHIBITION IN CORTICAL DYSFUNCTION.

(L. C. Card No. Mic 60-407)

Mary Kathleen Martin Huse, Ph.D.
Duke University, 1959

Supervisor: Oscar A. Parsons

The concept of cortical inhibition and similar concepts have received considerable attention in theories dealing with the brain processes which underlie behavior. The purpose of this study was to examine the utility of the concept of cortical inhibition in predicting the performance of brain-damaged individuals in a pursuit-rotor learning task. Pavlov stated that brain damage increases the in-

hibitory potential. Equating Pavlov's concept of inhibition with Hull's inhibitory constructs of reactive (I_R) and conditioned ($S I_R$) inhibition, drawing from the results of studies in motor learning, and making the hypothesis that cortical injury increases the inhibitory potential, differences in certain aspects of the pursuit-rotor learning of normal and of brain-damaged individuals were predicted. It was expected that the general level of performance of the brain-damaged would be lower.

Predictions.

I-A. During a work period sufficiently short to preclude the attainment of the $S I_R$ threshold, there will be more decline in the scores of the organics, due to a greater accumulation of I_R .

I-B. After such a short work period there will be more reminiscence in the organic group.

II-A. During long massed work periods $S I_R$ will develop in the organic group.

II-B. During long massed work periods there will be less decline in the scores of the organics, due to the development of $S I_R$.

II-C. After long massed work periods there will be less reminiscence in the organic group.

Method.

Groups of college students were employed to establish spaced- and massed-practice work-rest schedules which precluded the development of $S I_R$.

Spaced- and massed-practice control groups and spaced- and massed-practice organic groups, each composed of 20 hospitalized patients, were run in a pursuit-rotor learning task. These groups were equated on a number of control variables. All were physically able to perform the required movements.

Results.

The expected decrement in the performance level of the organic subjects appeared.

Results of the tests of the predictions were as follows: Prediction I-A, not confirmed; Prediction I-B, significant in the opposite direction; Prediction II-A, not confirmed, although the predicted effect appeared in the learning curves; Prediction II-B, confirmed; and Prediction II-C, confirmed.

The organic groups were divided into severely- and mildly-impaired sub-groups, which were compared to the controls.

There were striking differences in performance between these groups, the severely-impaired organics being the poorest, followed by the mildly-impaired organics and controls. Results of the tests of the predictions were as above, except that Prediction II-A was confirmed in the comparison between the severely-impaired organics and controls. The learning curves of the severely-impaired massed-practice group were strikingly different from those of the other groups.

Meaningful tests of Predictions I-A and I-B were prevented by the development of $S I_R$ in the severely-impaired massed-practice subjects during the short work period. Similarly, Prediction II-A was not adequately tested because of the development of $S I_R$ in the severely-impaired spaced-practice subjects.

Further studies were suggested to clarify these and other theoretical issues concerning the development of I_R and $S I_R$ and the relations between them.

Conclusions.

1. Motor learning in the cortically injured is impaired, even when there is no obvious motor impairment. The deficit in performance appears proportional to the severity of the organicity.
2. Massed-practice has a particularly deleterious effect on the motor learning of the brain-damaged.
3. The Hullian concept of conditioned inhibition appears to have some utility in predicting the performance of brain-damaged subjects in this task.
4. The role of reactive inhibition was not adequately assessed in this study.
5. Additional studies were suggested by the results.

Microfilm \$2.50; Xerox \$7.00. 146 pages.

A RORSCHACH STUDY OF NORMAL AND PSYCHOTIC SUBJECTS IN A SITUATION OF STRESS

(L. C. Card No. Mic 60-667)

Austin Jack Jernigan, Ph.D.
University of Kentucky, 1951

The purpose of this study was to compare the reactions of normal and psychotic persons to a stressful situation. For the purpose of this study the following definition of stress was set up:

The term stress refers to that aspect of the experimental procedure in which the individual is placed on the defensive by being forced to repeat the Rorschach test without repeating any of the original percepts.

In order to compare the reactions of normals and psychotics to a situation of stress, sixty-four male veterans of World War II were administered the Rorschach test; of this group, half had been hospitalized because of psychosis, and the others were general medical and surgical patients. Immediately upon completion of the free association responses to the last Rorschach card, the subjects were asked to respond to the Rorschach test a second time but were not permitted to repeat any of the responses given to the original Rorschach. Half of the subjects in each group were told that their original performance was inadequate (Level B); the remaining half were not informed as to the adequacy of the original performance, the individual being free to interpret the purpose of the instructions (Level A). Thus two records were obtained from every subject, a standard Rorschach and a Rorschach under pressure.

At the end of the experiment, each subject was asked to check one of three possible answers to each of seven questions which best described his reactions to the stress experiment.

There was some indication from the Rorschach analyses that Level B was a more disturbing condition of stress than was Level A, especially among the psychotics; however, the difference did not prove to be statistically significant. Only one Rorschach factor significantly discriminated between the reactions of normals to the two levels of stress. Under Level B stress normals increased significantly in the use of D, that is, toward a more practical approach.

The analyses of the answers to the questionnaire showed that more normals of the Level B group than of the Level

A group were disturbed by the experiment; there were no significant differences in the answers to the two psychotic groups. A significantly greater number of subjects in the Level B stress groups, as compared with the number of subjects in the Level A stress groups, answered questions indicating a desire to refuse to participate in the stress experiment and difficulty in achieving new percepts of the ink blots. There was some indication from the analyses of the questionnaire and Rorschach data that subjects who admitted or recognized emotional disturbance tended to have similar changes in Rorschach performance under stress.

This study shows that the characteristic which best distinguishes between the reactions of normals and psychotics to stress is the change in conscious control and ego strength. Normals maintain control when forced to perform under pressure; psychotics become even more regressive in behavior. Also, normals increase more in the display of affect under stress than do psychotics and tend to exercise a more mature control of this affect than when functioning under less trying circumstances. Psychotics, who typically function at a regressive level, become more impulsive and exercise even less control under stress.

From these conclusions on the behavior of normal and psychotic persons under stress, it is not to be inferred that an absolute dichotomy exists between the two groups in reactions to stress. Even in those areas in which the two groups differed significantly, similarity of functioning was found between some members of the groups. However, in general, the study indicated that under stress psychotics become more psychotic and normals retain their normality.

Microfilm \$2.50; Xerox \$7.40. 159 pages.

EXPLORATORY INVESTIGATIONS OF OPERANT CONDITIONING IN HUMANS UNDER A THERMAL DRIVE

(L. C. Card No. Mic 60-669)

David Thomas Johnson, Ph.D.
University of Kentucky, 1954

Exploratory investigations were undertaken to test the general assumption that any movement of any human organism can be conditioned provided only that a primary drive is present in the organism, and that the movement is regularly reinforced with a primary reinforcer complementary to the existing primary drive. The specific hypothesis to be tested was that: when any human organism is exposed to temperatures too high for optimal physiological functioning, any selected movement of the organism's striated musculature can be conditioned, provided that each occurrence of the selected movement is followed by exposure of the organism to a current of cooler air which will assist the organism to restore a temperature optimal for physiological functioning.

A primary drive was created by placing the subjects in a room in which the temperature was too high for their optimal physiological functioning. The reinforcer consisted of currents of cooler air, blown on the subject for five seconds each time she made the movement selected for reinforcement. In all experiments, all sessions were

of thirty minutes duration; and experimental sessions were held four consecutive days each week. The subjects employed in all experiments were low-grade feebleminded Negro females.

The results of three experiments failed to support the major hypothesis. The movements of some of the subjects in these experiments failed to show conditioning under the circumstances described in the hypothesis.

It was shown also, however, that under the conditions specified in the hypothesis, conditioning did occur in some of the subjects. Some of the subjects showed conditioning in these experiments, where the conditions were essentially the same as those in experiments with laboratory animals, particularly in respect to lack of instructions, absence of social stimuli, and virtual absence of verbal behavior on the part of the subjects.

Since experimental conditions were the same for subjects whose movements showed evidence of conditioning and those whose movements did not, the results suggest that other factors, characteristic either of the movements or the subjects, were responsible for the differences in conditioning. There is some suggestion from the results that one of the factors may be the presence or absence of a recurring stimulus for the original response.

The results of these experiments suggest that, even under the relatively simple and circumscribed experimental conditions employed, it was possible for some conditioning of some aspects of the response to occur, even though complete and precise conditioning of the response selected by the experimenter for reinforcement failed to occur.

The method and experimental conditions employed in these experiments offer fruitful potentialities for the comparison of various species, including the human, in regard to the conditioning of essentially similar responses. The method also affords a means of studying the characteristics of operant conditioning under a previously neglected primary drive, and of comparing conditioning under this thermal drive with conditioning under more traditional drives such as hunger and thirst. Because reinforcement with this reinforcer involves no activity on the part of the organism other than that for which it is reinforced, this method would seem to have value in studying the relation of consummatory responses to conditioning, and also for studying the learning of certain sequences of behavior having optimal durations of effectiveness.

Microfilm \$2.50; Xerox \$7.80. 170 pages.

A COMPARISON OF SOME THINKING PROCESSES IN NORMALS, ANXIETY NEUROTICS AND PARANOID SCHIZOPHRENICS.

(L. C. Card No. Mic 60-671)

John Kendall Kew, Ph.D.
University of Kentucky, 1951

This experiment was concerned with a quantitative comparison of the conceptual thinking processes of a normal, an anxiety neurotic, and a paranoid schizophrenic group of subjects. All of these subjects were male, natives of Kentucky, and veterans of World War II. In general, they were well-equated except for matters of mental health.

On this point they formed three distinct groups of people. The primary emphasis of the experiment was to compare these three groups with respect to the more concrete rather than abstract, categorical associations. A cue was taken from Goldstein and Scheerer concerning concrete thinking. They wrote that even the normal person's thinking is primarily concrete in nature. The subject's thoughts are given over to experiences of an unreflective nature. One's thinking in such a case is confined to the immediate apprehension of a given thing or a situation in its particular uniqueness. This is in contrast with abstract thinking where one conceives of things as belonging together because of common aspects which they share. Abstract thinking is categorical.

The Picture-Object Association Method

In the service of finding out as precisely as possible how normal and abnormal thinking differs within the conceptual process, the experiment was oriented primarily at the concrete level where the bulk of most people's thinking is said to lie. To facilitate this end, six pictures which had proven to be of interest to the average person were presented in succession to the subject along with a randomly-placed group of 29 small objects. These objects represented things which were familiar to the subjects. Among them were representatives of food and drink, household goods, money, a crucifix, a snake, a fly, and a spider. The subject was asked to select objects which he thought belonged with the pictures and tell why. The latter verbalized reasons for his selections furnished information about his associative, conceptual thinking processes.

The Objective Findings

The objective findings were that the Normal Group did use proportionately more abstract concepts than the Neurotic Group. The Normal Group and the Paranoid Schizophrenic Group did not significantly vary with respect to the production of abstract responses.

The Neurotic Group not only provided more functional associations, but they verbalized needs significantly more than the other two groups.

The Paranoid Group did not give significantly more concrete responses than the Normal Group. They did reveal an unreliable trend in the direction of concreteness. Both the Normal Group and the Paranoid Group gave significantly more concrete responses than the Anxiety Neurotic Group.

The classification of the concrete responses did yield rich results. Here definable forms of thinking were found which would differentiate psychotic from non-psychotic conceptualization. The concrete responses of all of the seventy-five subjects were categorized according to fourteen types of associations.

A Tentative Hypothesis

The attention which the anxiety neurotics pay to the use of objects and the frequent use of the word need in relation with an object have some value for speculative considerations. The writer adopted as a tentative hypothesis that the neurotics pay attention to the use of things, because he hopes to find relief from his tensions in the use

of the objects. The neurotic's manifest feelings of deprivation, it is thought, heighten their interest in the use of things.

In contrast, the normal people demonstrate quantitatively that they have learned to assume that objects will be available for their use. They do not, as a rule, think in terms of needing things which they do not have. They make no mention of needing things. Functional responses composed 56.37 per cent of the responses of the Normal Group. Abstract responses composed 10.74 per cent of their associations, and 32.89 per cent of their associations were concrete. The normal subjects did not seem to be so bound to the use of things as were the neurotics. The Normal Group appeared to reflect a more objective approach to the picture-object situation than did the anxiety neurotics or the paranoid schizophrenics.

Microfilm \$2.50; Xerox \$7.40. 157 pages.

PARENT-CHILD THEMAS AND CONCEPT ATTAINMENT IN SCHIZOPHRENIA

(L. C. Card No. Mic 60-467)

Phyllis S. Kreinik, Ph.D.
Duke University, 1959

Supervisor: Eliot H. Rodnick

The present experiment was designed primarily to compare the performance of poor and good premorbid male schizophrenics on a conceptual task involving both nurturant and censuring parent-child relationships. On the basis of presumed differences in actual parent-child interactions for these two groups of schizophrenics, it was anticipated that they would be differentially sensitive to the sex of the rejecting or criticizing parent. For poor premorbid schizophrenics, the mother has been identified as the more dominant and hence, presumably, more traumatogenic agent during childhood. On the other hand, for good premorbid schizophrenics, there is some evidence that the father may have been the more dominant parent. It was accordingly expected that the conceptual performance of the poor premorbid patients would be relatively more adversely affected by stimulus materials portraying a censuring mother-son relationship, whereas good premorbid patients would show relatively more deficit with comparable father-son pictures.

Four independent groups of 16 Ss each, participated in the research. All were males matched on a group basis for age, education, and estimated verbal intelligence. Recently hospitalized drug-free schizophrenic patients were classified as good premorbid (GPM) or poor premorbid (PPM) in accordance with ratings on the Phillips Scale of Premorbid Adjustment, which is based on case history data. An additional group of poor premorbid schizophrenics, under some form of ataractic drug therapy (D-PPM), was also included. Finally, a fourth group of normal control Ss, representing a wide range of occupational pursuits, was recruited in order to provide some baseline for comparison with the patient groups.

In order to assess the influence of parent-child themas upon conceptual functioning, a modification of the Bruner concept-attainment technique was devised. A Sample set

of 16 pictures, involving two geometric figures, was used to orient the Ss to the task and to eliminate those unable to cooperate in the experiment. In addition, five independent sets of 16 pictures each were individually administered to every S, in two sessions, with the sequences of presentation counterbalanced among the various Ss. Comprising the experimental series were: 1) a Neutral set which consisted of two non-human figures; 2) a Positive Mother set which portrayed a positively toned, nurturant mother-son relationship; 3) a Negative Mother set which presented a negatively toned, censuring mother-son interaction; and 4) Positive Father, and 5) Negative Father sets, which were comparable in composition and affective tone to the corresponding mother sets.

It was found that, in general, a marked improvement occurred in conceptual performance from the first to the second session. The only exceptions were the failure of the PPM group to improve on the Positive Mother set in the second session, and similarly, of the GPM group to improve on the Positive Father. Since the positive sets on the second day had been preceded by their negative counterparts in the previous session, these exceptions were interpreted as resulting from interferences in task adaptation evoked by the Negative Mother and Negative Father sets for the poor and good premorbid groups, respectively.

In overall performance, the normal Ss made significantly fewer errors than did the PPM patients; the GPM patients occupied an intermediate, and non-significant position between the other groups. The difference between GPM and PPM groups, in favor of the former Ss, was especially enhanced on the Positive Mother set, but showed a reversal on the Positive Father pictures.

The drug group solved the task significantly more rapidly than did the PPM group in the first session. Findings on the parental sets for the drug Ss, relative to the PPM Ss, were inconsistent.

Microfilm \$2.50; Xerox \$8.40. 181 pages.

THE EFFECTS OF AWARENESS ON VERBAL CONDITIONING

(L. C. Card No. Mic 60-468)

Saul Levin, Ph.D.
Duke University, 1959

Supervisor: Charles D. Spielberger

The present study investigated the relationship between the subject's awareness and his performance in verbal conditioning. Neuropsychiatric and medical patients were assigned to Experimental and Control Groups and required to construct sentences beginning with one of six personal pronouns and containing a past tense verb. For the Experimental Group, the experimenter reinforced sentences beginning with I and we by saying "good"; the Control Group performed without receiving any verbal reinforcement from the experimenter. A post-experimental interview was employed to obtain information regarding the subject's awareness of a contingency between the reinforced response and the reinforcement. The first four questions of the interview were approximately the same as the questions

used to investigate awareness in previous research; the remaining questions were designed to obtain additional information from the subject while not suggesting a correct contingency to him. Two criteria of awareness, based on the subject's response to the first four questions and to the full interview, were employed. In addition, data on the subject's intelligence, his motivation towards the reinforcement were obtained.

It was found that significantly more subjects were aware when the full-interview criterion was employed than when the four-question criterion was employed.

The effects of awareness on verbal conditioning were evaluated where awareness was investigated by means of the four-question interview and also where the method of investigating awareness was the full interview.

The following results were obtained:

(1) When the four-question criterion of awareness was employed, there was evidence for conditioning without awareness.

(2) When the full interview criterion of awareness was employed more subjects were aware, and the Aware Group showed conditioning. The Unaware Group, as a whole, was not significantly different from the Control Group.

(3) Subjects who were aware of the reinforcement of a specific first person pronoun (either I or we) showed conditioning on that pronoun only. There was no evidence for conditioning without awareness of the pronoun for which these subjects were unaware of the reinforcement.

(4) Subjects who were unaware of the reinforcement, in addition to being unaware of a correct contingency, showed as much conditioning as subjects who were aware of a correct contingency.

(5) There was no relationship between the subject's motivation towards the task or towards the reinforcement and his conditioning performance. In addition, motivation towards the reinforcement was not related to the subject's being classified as aware of a correct contingency.

(6) In the case of the neuropsychiatric patients, only the more intelligent subjects became aware of a correct contingency.

The finding that more subjects were aware when a more extensive and specific interview was employed than when a briefer and more general interview was employed pointed up the importance of the method by which awareness is investigated in verbal conditioning research. Thus, subjects classified as unaware in previous studies of verbal conditioning might have been classified as aware on the basis of a different method of investigating awareness. The fact that subjects were aware evidenced improvement in performance as a function of reinforcement and the fact that such improvement was specific to a pronoun for which they were aware of the reinforcement, suggested that the subject's awareness is an important determiner of verbal conditioning. Although the present findings emphasized the importance of awareness in verbal conditioning, they also provide limited evidence for conditioning without awareness in that a group of subjects who were unaware of the "good", in addition to being unaware of a correct contingency, showed learning comparable to the subjects who were aware of a correct contingency.

Microfilm \$2.50; Xerox \$4.80. 93 pages.

A COMPARATIVE STUDY OF LEVEL OF ASPIRATION VARIABLES IN NEUROTIC, PSYCHOPATHIC, AND NORMAL SUBJECTS.

(L. C. Card No. Mic 60-675)

Murray Jerome Lonstein, Ph.D.
University of Kentucky, 1952

The primary purpose of this investigation was to validate experimentally some of the sixteen clinical formulations listed by Cleckley. It was believed that a psychological technique which might be used satisfactorily for this purpose is the task known as the "level of aspiration" experiment, which has been used in the study of motivation and emotion. Its utility has been demonstrated in the study of personality variables such as narcissism, projection, and rigidity.

It appeared reasonable to expect that the validity of the following four clinical observations could be tested by the level of aspiration technique:

1. Poor judgment and failure to learn by experience.
2. Pathological egocentricity and impulsivity.
3. Specific loss of insight.
4. Inadequately motivated, non-conforming behavior.

That is, information regarding the psychopath's setting of aspirations or goals and his reactions to success and failure might experimentally verify these four traits, knowledge of which has been inductively obtained from case histories.

It was deduced that level of aspiration behavior involves such personality variables as judgment, learning by experience, insight, impulsivity, egocentricity, and non-conforming tendencies. On the basis of this deduction it was hypothesized that the psychopath's level of aspiration would be unrealistically high in comparison with that of the neurotic individual, who is cautious and sensitive to social standards, and in comparison with that of the normal person. In view of the psychopath's alleged insensitivity to punishment and praise, it was also hypothesized that his reactions to success and failure would differ from those of the normal and neurotic person.

Selection of the psychopathic group (twenty-five subjects) was made according to two criteria; (1) official hospital diagnosis, and (2) a screening technique, the Diagnostic Supplement, which was based upon Cleckley's clinical profile.

In regard to responsiveness to success and failure, it was found that a salient characteristic of psychopathic behavior was the great frequency of Unusual Shifts. The psychopathic group made significantly more of these shifts than the other two groups in all but the Group Administration. In the Individual Administration the psychopathic group made significantly fewer Conforming Shifts than the normal group.

The social-competitive factor exerted no influence upon any of the facets of level of aspiration behavior of the psychopath. On the other hand, both the normal and neurotic groups changed, making significantly fewer Conforming Shifts in the group situation. This change in behavior was the only one which could be attributed to the social-competitive factor.

The results demonstrated that there is so much consistency in the functioning of the psychopathic personality that the four traits listed above, derived from clinical observation of the everyday behavior of psychopathic

personalities, also appear in an experimental situation of short duration. The hypotheses that psychopathic personalities, competently judged to possess these traits, would over-aspire in goal-level setting and would react in a deviant fashion to success and failure were confirmed in the Individual Administration of the Target Aspiration Task.

In summary, the considerable number of positive findings endorsed the logic of the deduction that the level of aspiration technique could bring into relief, in a comparative study, certain traits of the psychopathic personality. They therefore rendered credible by means of an experiment some clinical and theoretical formulations concerning this kind of personality structure.

Microfilm \$2.50; Xerox \$6.80. 145 pages.

A RORSCHACH STUDY OF SUICIDE

(L. C. Card No. Mic 60-682)

Harry Martin, Ph.D.
University of Kentucky, 1951

The primary purpose of this investigation was to determine whether there is a difference between a group of people who have attempted suicide and a comparable group who have given no evidence of suicidal tendencies. The Rorschach test was the tool employed to compare these groups. Although the Rorschach test had been utilized unsuccessfully in previous studies of suicide, a different technique of Rorschach analysis was applied in this investigation. The technique employed was the sign-checklist approach to Rorschach analysis. A revised checklist was developed as a tool for further research (not shown here). A secondary purpose of the investigation was to determine some of the Rorschach indicators of suicide.

The subjects of this investigation were 144 male patients, hospitalized in Veterans Administration Neuro-Psychiatric Hospitals. The subjects consisted of two major types, Suicidal and Non-Suicidal. Seventy-two of the subjects had made at least one suicidal attempt, while seventy-two had shown no suicidal tendencies. The subjects were divided into four sub-groups of thirty-six patients each, Suicidal I (SI), Non-Suicidal I (CI), Suicidal II (SII), and Non-Suicidal II (CII). The four sub-groups were matched on the basis of age, diagnosis, education and intelligence, occupation, and total number of Rorschach responses in order to make them as similar as possible and practicable except for the tendency toward suicide.

The investigation was divided into two phases, exploration and replication. The groups which were used in the exploratory phase were SI and CI. The Rorschach records of these two groups were compared with respect to the various Rorschach scoring categories and the point of greatest difference between the groups was noted for each category. The point of greatest difference was used as a cutting point and the distributions were combined to form a 2 x 2 table. The difference between the groups were tested for significance by the chi square test of independence. When the difference was such that the probability was equal to or less than the 10 per cent level, the cutting point score was listed as a sign. Sixteen signs were derived in this manner and compiled to form a checklist.

The second phase of the investigation constituted a replication in that it tested the ability of the criteria developed in the exploratory phase to differentiate two new samples. The groups which made up the second phase of the study were SII and CII. Each person in each group was scored on the checklist developed in the exploratory phase. The total number of signs for each individual was recorded as a composite score. The mean score for each group was computed and the difference between the means of the two groups was tested for significance by computing the critical ratio. A reliable difference was found between the mean scores of SII and CII. It was concluded then that there is a reliable difference between a group of people who have attempted suicide and a group who have evidenced no suicidal tendencies and that this difference is related to the fact that the former group has attempted suicide.

In order to determine some of the individual Rorschach indicators of suicide, SII and CII were compared on each sign of the checklist. The following signs were established as reliable, individual Rorschach indicators of suicide:

1. The number of CF responses is greater than zero but less than three.
2. Sum C is greater than 1.0 but less than 3.5.
3. When C and/or CF responses appear in a Rorschach they occur first on Cards VIII, IX, or X.
4. C and/or CF responses appear in a Rorschach when Y responses (FY + YF + Y) are absent.
5. The total shading responses, Y and V and their variations, equals zero.

All of the five signs listed above are concerned with color and/or shading responses.

In summary, this study shows that a suicidal-attempt group, grouped purely on the basis of their having attempted suicide, can be differentiated from a non-suicidal group. This finding refutes the argument which holds that to compare these two groups will lead to ambiguous and inconclusive results. The sign-checklist approach to Rorschach analysis is suggested as an important method of investigating suicide. The revised checklist which was developed in this study is proposed for further study of suicide.

Microfilm \$2.50; Xerox \$6.20. 128 pages.

A COMPARISON OF SIGN AND CLINICAL APPROACHES IN PREDICTING PSYCHIATRIC DIAGNOSIS

(L. C. Card No. Mic 59-6425)

Harry Jerome Martin, Jr., Ph.D.
University of Houston, 1959

The purpose of this study was a two-fold one: first, to undertake a comparative evaluation of two actuarial sign approaches in terms of the relative efficiency in predicting to the criterion variable of psychiatric diagnostic categories; and, secondly, to make a comparison of the relative diagnostic efficiency of these sign approaches and that of a group of clinician judges.

The psychodiagnostic techniques used in this study, from which the sets of diagnostic signs were derived, and

from which the clinician judges predicted to the psychiatric diagnosis, were the Rorschach technique, the Wechsler-Bellevue Intelligence Scale (Form I), and a test battery composed of these two instruments with the addition of a word-association test.

The population of the psychodiagnostic tests consisted of the test records of 60 patients from the University of Texas Medical Branch Hospitals, in Galveston, Texas. The validation criteria were three independent diagnoses made by senior psychiatric residents. The psychiatric diagnostic categories investigated in this study were Depression, Hysteria, Obsessive-Compulsive States, Organic Brain Damage, Psychopathic Personality, and Schizophrenia.

One aspect of examiner variance was evaluated: level of training and experience. Fourteen judges took part in the clinical predictions. Of these fourteen, seven judges had at least two years of clinical internship training, and ranged upward through the post-doctoral, supervisory level. The other seven judges had no more than one year of internship training, and ranged downward through graduate students in clinical psychology with didactic training only. The hypothesis was put forward that increased experience and training would be accompanied by increased accuracy of diagnostic prediction.

A total of 72 numerical test signs were derived from the Wechsler-Bellevue test and from the Rorschach technique, five signs for each of the six diagnostic categories in the case of the Wechsler-Bellevue, and seven signs for each of the diagnostic categories in the case of the Rorschach technique. These signs were applied to each of the 60 cases in order to investigate the purported diagnostic efficiency of the signs.

The fourteen psychologist judges individually made diagnostic predictions from the same 60 cases as were sorted by the sign approach, with these clinical predictions being made on the basis of the Wechsler-Bellevue alone, the Rorschach technique alone, and on the basis of a composite test battery made up of these two tests with the addition of a word-association test.

A number of conclusions were drawn from this study. In the comparison of the actuarial signs from the Wechsler-Bellevue and from the Rorschach technique, it was learned that the Wechsler-Bellevue signs predicted more accurately than the Rorschach signs in the Depression, Obsessive-Compulsive, and Psychopathic categories, these differences being statistically significant. The Rorschach signs excelled the Wechsler-Bellevue only in the instance of Organic Brain Damage, the difference not being statistically significant.

In the analysis of the diagnostic efficiency of the Wechsler-Bellevue signs alone, it was learned that the Obsessive-Compulsive signs were the most effective in terms of predicting to that specific category. The Psychopathic signs were nearly as efficient as the Obsessive-Compulsive signs, whereas the groups of signs for the other four diagnostic categories proved relatively inefficient. It was also observed that a great amount of test performance overlap existed among the Hysteria and Psychopathic groups, and among the Depression and Organic groups. The signs of Schizophrenia proved to be without diagnostic value.

In the investigation of the diagnostic efficiency of the Rorschach signs alone, it was found that none of these sign groups could be used to predict to the specific diagnostic categories without such a large number of false-positive

selections as to invalidate the predictions. The Organic signs proved to be relatively the most efficient of the Rorschach sign groups, and the Schizophrenia signs again proved to be without diagnostic value.

In the analysis of the diagnostic predictions made by the psychologist judges, it was learned that more accurate predictions were made from the Wechsler-Bellevue than from the Rorschach, this being true in all of the diagnostic categories but that of Organic Brain Damage, where the judges did relatively better with the Rorschach technique. This same result was found in the comparison of the Wechsler-Bellevue and Rorschach sign approaches.

It was learned that the judges, using the Wechsler-Bellevue only, made their highest percentage of correct diagnostic predictions in the Obsessive-Compulsive and Psychopathic groups, and made the lowest percentage of predictions in the Schizophrenic group. This exactly paralleled the results found in the analysis of the Wechsler-Bellevue signs.

Using the Rorschach alone, the judges scored their highest degree of success in the Organic category, and did most poorly with the Depressive and Hysteria categories. The judges had a higher degree of success in predicting to the Schizophrenic group with the Rorschach than with the Wechsler-Bellevue, this being the only instance in which both levels of judges excelled.

With reference to the problem of examiner variance, it was learned that the more experienced clinicians excelled the less experienced clinicians in the diagnostic use of the Wechsler-Bellevue in each of the six diagnostic categories. With the Rorschach test, the same results were found in all instances but that of Psychopathic Personality, where the percentages were equal.

In attempting to effect a direct, case-by-case comparison of the predictive efficiency of the actuarial test signs with that of the psychologist judges, it was decided that the data did not permit such a direct comparison which would not involve some arbitrary and necessarily unfair system of weighting and cut-off points. However, from inspection of the raw data, it is apparent that the clinicians demonstrated a greater predictive efficiency in diagnosing the individual case than did the actuarial signs.

Microfilm \$2.50; Xerox \$5.40. 107 pages.

A STUDY OF THE BEHAVIOR OF PARANOID SCHIZOPHRENICS ON THE THEMATIC APPERCEPTION TEST

(L. C. Card No. Mic 60-686)

William Walker Nagge, Ph.D.
University of Kentucky, 1951

Statement of the Problem

This is a study of the behavior of paranoid schizophrenics on the Thematic Apperception Test. An attempt is made to relate the behavioral aspects of apperception to the facts of impairment. This is thought to be a worthy problem, inasmuch as clinical psychologists have made an invasion of the field of psychiatric diagnosis.

The Paranoid Population

The "paranoid" population of a State Mental Hospital

was surveyed and twenty-nine cases were carefully selected by two psychiatrists. Seven of these members refused to complete the test, leaving twenty-two patients to be studied. The reliability of psychiatric diagnosis in a mental institution is shown to be a special problem, essentially a different one from that of an out-patient clinic.

Tests and Methods

The concept of test validity is examined and shown to be a very relative ideal. The need-press methods of scoring and interpretation are challenged as making assumptions which seem untenable. A pilot study of test and retest on paranoids at a two-year interval suggested that, with the test and the impairment both relative constants, the scored needs were chaotically different. This means that paranoid schizophrenia can probably not be defined on "need" coordinates.

The method chosen for this investigation was (1) a simplified test administration, (2) special analyses of specific items, (3) a reduction technique to allow easy inspection of a story, (4) a card-by-card comparison between the group of paranoid patients and a non-psychotic control group, and (5) the usage of the "t" test of significance as expressed through the standard error of a mean difference.

Implications and Summary

Implications for the test may be summarized as follows: (a) The cards are not a homogeneous series such that a specific theme expressed on a particular card may be more meaningfully related to the specific stimulus content of the card than to a psychological pathology; (b) The cards appear to have task aspects as well as projective ones; (c) The "need" definitions are shown to be possibly too broad; (d) The male and female series seem to evoke very different material such that data from both sources should probably not be pooled; and (e) The associations evoked by the TAT are so selective that the testing of dynamic theories of personality with this instrument is possibly precluded.

The implications for the clinical category of paranoid schizophrenia are developed from the point of view of the diagnosis and also from the point of view of an interpretation of category. The manner in which the paranoid tries to use specific detail as behavioral support and the asking of many questions is attributed to a lack of confidence, or faith, in his own apperception and intuition.

Implications for a psychiatric nosology make reference to the aged and deteriorated population of a state mental hospital and point out that any nosological scheme must pay deference to the facts of organic deterioration. Tests used in a basic way near the behavioral level of perceiving, thinking, and remembering may have an important role in the re-evaluation of clinical concepts. The dynamic theories will probably be of limited usefulness in this setting.

It is concluded that at the present time the diagnosis of psychosis is a completely common sense affair and that there is no special anatomical or physiological knowledge that compels this judgment. A person with any known physiological damage can be with, or without, psychosis; this is seen to be a judgment based essentially on the language and behavior. Psychologists will probably have an important role in the construction of a nosology.

Microfilm \$2.50; Xerox \$6.40. 132 pages.

A STUDY OF PSYCHOANALYTIC SYMBOLISM IN RELATION TO STIMULUS GENERALIZATION

(L. C. Card No. Mic 60-687)

Robert C. Nichols, Ph.D.
University of Kentucky, 1953

Supervisor: Dr. James S. Calvin

Four experiments were directed toward determining the amount of stimulus generalization shown to masculine and feminine Freudian symbols after conditioning to more usual concepts of masculinity and femininity had taken place.

In the first symbol experiment the galvanic skin response of thirty-six subjects was conditioned to the concept of masculinity for half the subjects and to the concept of femininity for the other eighteen subjects. The subjects were then presented nine verbal stimuli: three synonyms of the conditioned stimulus, three masculine symbols and three feminine symbols. It was hypothesized that those subjects who received the masculine conditioned stimulus would show a larger GSR to the masculine symbols than to the feminine symbols, and that those who received the feminine conditioned stimulus would show a larger GSR to the feminine symbols, and that the responses to the symbols would be smaller than to the synonyms.

The two groups were further sub-divided on the basis of sex of subject and anxiety of subject. Anxiety was measured by means of the Taylor scale of manifest anxiety, and the subjects were selected from the upper, middle and lower ten percent of the distribution of anxiety scores.

The results of this first experiment were essentially negative.

To clarify the reasons for the failure, a tone experiment was performed immediately after the symbol experiment, with the same subjects, using the same procedure and pattern of reinforcement as in the first symbol experiment. The factorial design incorporated sex of subject, anxiety and strength of the unconditioned stimulus as variables in a 2 x 3 x 3 division of the subjects. The generalization gradient along the known similarity dimension of varying frequencies of tone was found to increase with decreasing similarity to the conditioned stimulus, in the opposite direction to the expected gradient. The empirically determined gradient was attributed to an interaction of the generalization gradient of the conditioned response with that of the inhibition of reinforcement. The variables of anxiety, sex of subject, and strength of the unconditioned stimulus were found to have little effect on the response of the subject.

The symbol and tone experiments were repeated with certain changes in the procedure designed to reduce the amount of inhibition of reinforcement, and the experiments were simplified by not including sex of subject, anxiety or strength of the unconditioned stimulus as variables.

The symbol experiment was repeated with twelve subjects receiving the masculine conditioned stimulus and twelve the feminine conditioned stimulus. The subjects were then presented one synonym of the conditioned stimulus, two feminine symbols, two masculine symbols and one non-symbol. These six generalization stimuli were presented to each subject twice in a counterbalanced order.

A decreasing generalization gradient was found in the predicted direction. The response to the synonym was significantly higher than the response to the non-symbol, and the responses to the masculine and feminine symbols were intermediate between these two extremes. Thus the Freudian concept of sexual symbolism is supported.

The tone experiment was repeated, in a greatly simplified way, using eight subjects as a check on the efficiency of the changes in procedure from the first experiments in reducing the amount of inhibition of reinforcement built up. Decreasing gradients were found in the second tone experiment, testifying to the effectiveness of the changes in procedure.

The results of the second symbol experiment may be interpreted as supporting the Freudian hypothesis of the symbolic sexual quality of certain concepts, and there is some support for the idea that these symbolic concepts are either essentially masculine or essentially feminine.

Microfilm \$2.50; Xerox \$7.20. 152 pages.

AN EXPLORATION OF THE RELATION OF CERTAIN THEORETICAL CONSTRUCTS TO A BEHAVIORAL SYNDROME OF BRAIN PATHOLOGY

(L. C. Card No. Mic 58-7232)

Howard Jerome Norris, Ph.D.
Syracuse University, 1958

The present study was an outgrowth of the author's interest in the perseveration and distractibility observed in many brain damaged children. A review of the literature in this area revealed that perseveration and distractibility were observed to occur so frequently among organic children that these modes of behavior were considered to be one of several signs indicating possible brain damage. With few exceptions, however, little was offered in the way of theory which systematically accounted for such behavior.

One notable exception provided a loose but consistent theory which contained two important constructs, i.e., Negative Induction (NI) and Exaggerated Inhibition (EI). The theory, however, was couched in vague physiological terms and dealt with equally as vague physiological mechanisms. This author revised the theory so that the terms and the theoretical mechanisms were essentially psychological in nature and were precisely defined. It was possible, therefore, to derive specific behavioral phenomena which were put to rigorous experimental tests. Since the behavior was derived consistently from the theory, these tests reflected on the adequacy of the theory.

The basic hypothesis of this study was that an extraneous stimulus of increasing intensity would have a differential interfering effect on the constructive task performance of normal children and on the constructive task performance of organic children. It was this differential effect that was fundamental to a theoretical explanation of the inordinate perseveration and distractibility exhibited by many organic children. The differential effect was a function of the operation of two differing interference thresholds, i.e., a generally lower one for normal children and a generally higher one for organic children. It was also a function of theoretically different modes of operation of the interfering effect of an extraneous stimulus once threshold intensity of that stimulus had been reached.

Five specific primary hypotheses and seven specific secondary hypotheses were derived from the theoretical considerations presented in the current study. These hypotheses predicted the performances of organic children and of nonorganic children on a particular task. The task was devised to test the adequacy of the theory by determining the theory's predictive power.

The subjects consisted of 30 organic (cerebral palsy) children and 30 nonorganic children who ranged in chronological age from 8 years 6 months to 16 years 0 months and who had minimum I.Q.'s of 75. Each normal child was equated for mental age with each cerebral palsy child. Under experimental conditions, subjects were asked to identify a number of different series of three dots and dashes presented auditorily through one earphone of a set of earphones while a pure tone of intermittently increasing intensity was presented through the other earphone. The series of dots and dashes was considered to be the task while the pure tone was considered to be the extraneous stimulus. Under control conditions, subjects were asked to identify the same series of auditorily presented dots and dashes. However, under this condition, no extraneous stimulus was presented.

Statistical significance was determined by means of probabilities which were provided by an expansion of the binomial distribution. This statistical technique was employed because it proved most adequate in fitting the conditions imposed by the present research design, i.e., data were obtained in terms of frequency and subjects were matched for mental age. Investigation, however, revealed that mental age had no significant effect on subject performance. Consequently, the severe test furnished by the binomial probabilities necessitated a reexamination of the results and a more liberal reinterpretation of them. Such a reexamination revealed that there was no evidence which supported the theory offered in this study. While two of the hypotheses appeared to be statistically significant and a number of others were of questionable significance, one of the primary hypotheses crucially related to the theory was definitely not significant.

Microfilm \$2.50; Xerox \$8.00. 171 pages.

A STUDY OF PERCEPTUAL DISCRIMINATION IN SCHIZOPHRENICS AND NORMALS

(L. C. Card No. Mic 60-689)

Henry Oppenheim, Ph.D.
University of Kentucky, 1955

Supervisor: Dr. Robert E. Bills

This study resulted from some ambiguity concerning the possibility of a perceptual disturbance in schizophrenia. It had been maintained that observed differences in the perceptual performance, if any, between schizophrenics and normals were largely to be attributed to motivational factors such as differences in attention or distractibility. It had also been suggested that schizophrenics would perform as well as normals on very easy perceptual discriminations, but would do less well on difficult discriminations.

This investigation attempted to measure the perceptual performance of a group of schizophrenics and a group of normals on a series of simple brightness discriminations

of varying difficulty in order to determine whether schizophrenics exhibit an actual perceptual deficit not attributable to their allegedly greater distractibility. Thirty schizophrenic and thirty normal male subjects were required to discriminate the brighter of two light stimuli simultaneously presented for two seconds. Five levels of difficulty were used and presented in a randomized order. Each subject was required to make two hundred and twenty-five discriminations, and report whether the right or left stimulus appeared to be the brighter. The number of errors was taken as an index of the efficacy of the perceptual response. One measure of distractibility consisted of a discrepancy score which compared the subject's performance on the series of presentations made up of a randomized sequence of discriminations of different difficulty with his performance on another series made up of discriminations at the same difficulty.

Since the first distractibility measure had been part of the discrimination situation, a second outside measure was desired. The index used was each subject's variability in a cancellation task as measured by the standard deviation about the mean number of errors he made in the twelve sections of the task.

The results of the investigation indicated that the schizophrenic group consistently made more errors in discrimination at all five levels of difficulty. The differences between the groups was not reduced on the easier as compared to the more difficult discriminations. When the operational measures of distractibility were taken into account by analysis of covariance, the net results still indicated a substantial difference between the schizophrenic and normal groups. At only one level of difficulty for one of the distractibility measures were the differences reduced to approximately zero. The first measure of distractibility did not reduce the differences between the groups at all. This finding agreed with the examiner's impression that the two groups were attending about equally well in the discrimination situation. On the second distractibility measure, the schizophrenics did show greater intra-individual variability on the cancellation tasks, and adjustments of the mean error scores reduced the differences between the two groups below the level of statistical reliability at three of the five levels, although the overall difference remained significant.

The results suggest that a residuum of perceptual difference remains between schizophrenics and normals in ability to perceive basic environmental differences which are most probably not due to motivational differences. The theoretical implications of these findings were discussed mainly in terms of a possible reason for the perceptual disturbance in the schizophrenic process, and also in terms of their relation to current perceptual theory. The investigation further pointed to the continuing need for finding more precise tools for the measurement of possible motivational variables involved in research in this area. Finally, it was felt that the current investigation might stimulate additional work in related areas and a number of research possibilities were discussed.

Microfilm \$2.50; Xerox \$4.80. 91 pages.

AN INVESTIGATION OF ASSOCIATION-PROVOKING PROPERTIES AND MEANINGS ATTRIBUTED TO THE RORSCHACH INKBLOTS

(L. C. Card No. Mic 60-692)

Cecil P. Peck, Ph.D.
University of Kentucky, 1951

The purpose of this study was to investigate the association-provoking properties of the Rorschach inkblots and to test the hypothesis that certain Rorschach cards are perceived as having symbolic meanings. In so far as possible an attempt was made to state hypotheses about the association-provoking properties of the Rorschach cards and to test these hypotheses. Some specific hypotheses which were tested are as follows: (a) that responses to Card III can be interpreted on the assumption that they reflect a subject's interpersonal adjustment; (b) that responses to Card IV can be interpreted on the assumption that the card is perceived by a subject as a "Suicide symbol," as a "Father symbol" or a "Symbol of Authority"; (c) that a subject's reaction to Card VI can be interpreted on the assumption that the card is perceived as a sexual symbol; and (d) that responses to Card VII can be interpreted on the assumption that the card is perceived by a subject as being symbolic of a "Mother figure," as a "Home card" or a "Female card." These hypotheses were formulated on the basis of relevant information found in the literature and on assumptions which have spread by informal communication between clinicians who employ the Rorschach test.

The hypotheses in this investigation were tested by means of a word-card-association technique. In Rorschach theory it is assumed that these perceptions occur for the most part unconsciously. However, it was felt that the word-card-association technique would yield results which would not be completely independent of symbolic and unconscious mental processes.

In this investigation, three groups of thirty-five subjects each were used. They were as follows: male neuropsychiatric patients, male normals, and female normals. The male and female normals were combined to form a normal group. All the groups combined composed the total sample of 105 subjects. The male neuropsychiatric patients were composed of neurotics, schizophrenics and character disorders.

The following conclusions were reached about the association-provoking properties and the meanings attributed to each of the Rorschach cards:

Card I has an unpleasant feeling-tone and is generally perceived as having fearful and unpleasant properties.

Card II has association-provoking properties which have emotional implications that are generally perceived as unpleasant. Support was not found for the hypothesis that this card is perceived as a "Father symbol."

Card III has association-provoking properties that involve human qualities which are generally related to the male sex. Support was found for the hypothesis that this card is generally perceived as being related to human or interpersonal relationships.

Card IV has association-provoking qualities which have an unpleasant feeling-tone and is generally perceived by a subject as having dysphoric, fearful, and powerful qualities. Support was not found for the hypothesis that

this card is perceived specifically as a "Father Card," or a "Suicide card." Support was found for the hypothesis that this card is perceived as an authority symbol.

Card V has association-provoking properties which generally have an unpleasant feeling-tone.

Card VI has association-provoking qualities which have an unpleasant feeling-tone. Support was found for the hypothesis that this card is often perceived as a sexual symbol.

Card VII has association-provoking properties which have an unpleasant feeling-tone. Support was not found for the hypothesis that this card is perceived as a "Female" or "Mother" symbol. The word-card-association did not support the hypothesis that this card is perceived as a "Home card."

Card VIII has association-provoking properties of an emotional nature which are generally perceived as having a pleasant feeling-tone.

Card IX has association-provoking properties of an emotional nature which are generally perceived as having a pleasant feeling-tone.

Card X has association-provoking properties of an emotional nature which are generally perceived as having a pleasant feeling-tone.

As the results of this study suggest there are great individual differences in the perception of symbolic meanings of the Rorschach cards, it is felt that the word-card-association technique may be useful in identifying the meaning which a subject associates with a card.

Microfilm \$2.50; Xerox \$8.40. 184 pages.

GENERALIZATION OF FEAR AND OF THE INHIBITION OF FEAR

(L. C. Card No. Mic 58-7233)

Louis George Porter, Ph.D.
Syracuse University, 1958

Supervisor: Wallace R. McAllister

The present study was designed to determine (a) whether fear and the inhibition of fear both generalize, and (b) whether the level of the contextual environment (S_{CE}) affects performance.

A total of 100 naive hooded rats, 50 males and 50 females, were given 30 fear acquisition trials paired presentation of CS and UCS. On the following day, 20 extinction trials were given, followed by the acquisition of hurdle-jumping (40 trials). During fear acquisition one half of the Ss were trained with an intertrial illumination provided by a high intensity light (CE_H); the other half were trained with a low intensity light (CE_L). Each half was further divided into three experimental groups and two control groups, each group consisting of ten Ss, five of each sex. The experimental groups differed only in terms of the stimuli at which extinction trials were given. One group was extinguished at the CS (116.4 foot-candles); the other groups were extinguished at one of two generalization stimuli (5.4 or 25 foot-candles). One control group did not receive extinction trials, although it was placed in the shock box for an equivalent time interval. The other control group received 30 backward conditioning trials.

Following acquisition and extinction training, all Ss were given hurdle-jumping trials during which the CS was presented without the shock and the S permitted to jump a hurdle and enter a second compartment, thus escaping the CS. Following completion of the response or after failure to make the correct response in 60 seconds, the CS was terminated by the E and the S was removed to its holding cage. The latency of the hurdle-jumping responses and the number of failures to cross the hurdle in 60 seconds provided the response measures.

Of the two control groups employed, the control group which did not receive extinction trials was used to determine whether fear was conditioned and extinguished in the experimental groups. The backward conditioning group was employed to control for the possibility that (a) performance in the hurdle-jumping apparatus was due to any inherently noxious characteristics of the CS (i.e., sensitization) and that (b) unrecognized cues of the fear-conditioning box were conditioned as well as the CS.

The results indicated that fear and the inhibition of fear generalize. It was concluded that the effect on performance to the CS is an inverse function of the distance from the CS that extinction trials are given. Thus, fear has the same generalization properties as other overt learned responses.

The most reliable finding of the present study was that little or no learning occurred when the S_{CE} was close to the CS on the same stimulus continuum. This finding is consistent with the theoretical predictions of Perkins and of Logan. That is, S_{HR} conditioned to the CS would generalize to the S_{CE} . S_{IR} would then develop to the S_{CE} and generalize back to the CS, since any response to the S_{CE} would not be reinforced. Thus it seems reasonable to assume that the addition of the intervening variable V is not necessary, since the empirical facts for which it attempts to account may be accounted for by other, more basic postulates of Hull's theory.

The results also suggest that the combined effects of the generalization gradients of S_{ER} and S_{IR} produce a steep, convex upward gradient. Such a steep gradient suggests that there is a point on the stimulus intensity continuum between the CS and S_{CE} beyond which the combined effects of S_{HR} and S_{IR} gradients do not effect performance. Three alternative interpretations were proposed to explain this result.

Microfilm \$2.50; Xerox \$5.20. 104 pages.

THE EFFECT OF MOTOR ABILITY LOSS ON COGNITION AND EMOTION

(L. C. Card No. Mic 60-395)

John Marshall Rhodes, Ph.D.
University of Southern California, 1959

Chairman: Professor Harvey

At various times in the history of psychology, questions concerning the relation of thought to action have arisen. A logical development from this concern has been the dichotomy of peripheral versus central physiological mechanisms in thought. Paralleling this has been a comparable dichotomy in the area of emotions.

Three general positions were developed for investigatory purposes: (1) a peripheral position implying some localization of function and/or the possibility of a reliance on interoceptive responses as well as proprioceptive responses; (2) a central position in which neither proprioception nor interoception were necessary for thought or emotion; (3) a facilitative position in which any responses would be concomitant variations occurring either as or in addition to the basic processes for thought. Eight subhypotheses were developed from these positions and served as the framework for the experimental procedures.

For the purpose of providing a controlled constancy of proprioception, male poliomyelitic patients were selected to serve as experimental subjects. These patients were matched with a control population equivalent in age and intellectual function. A measure of motor loss was obtained by establishing a lean-body mass creatinine coefficient deficit for all experimental subjects.

The experimental procedure contained five sections: (1) general instructions and base levels; (2) imagery tasks; (3) spatial relations problem solving; (4) rhythm recognition; (5) rapid discrimination. During all sections of the experiment continuous recordings of all measures were made. These measures consisted of (1) heart rate, (2) skin temperature, (3) GSR, (4) eye blinks, (5) muscle action potentials from biceps and ocular muscles. Tape recordings were made of all experimental sessions to assist in locating stimuli and determining time segments on the data records. With the exception of the tape recorder, all measures were recorded through a ten-channel electroencephalograph with multiplexing of the GSR and heart rate, time, and event markers.

When the two groups were compared for the various measures, there were no significant differences in the muscle responses for either arms or eyes. There were no significant differences for eye blinks or heart rate, although the experimental group showed consistently higher heart rate with the exception of the beginning of the spatial relations problem-solving task. The experimental group showed a consistently higher increase in skin temperature throughout the experiment. The experimental group also showed a significantly greater GSR responsivity on the last half of the spatial relations problem solving, the rhythm recognition, and the rapid discrimination. The time relations for the spatial relations problem solving showed the experimental group to be significantly slower than the controls, although this difference did not hold true for the rhythm recognition task.

Those hypotheses stemming from a peripheral position were not supported by the results, with the exception of the one time difference. Although localization of function was not supported, those hypotheses relating to interoceptive responses as a substitute were supported. The results for those hypotheses related to the facilitative position were not unequivocal; however, there were significant differences in the predicted direction on some tasks.

An over-all evaluation of the results suggests a trend in the direction of increased autonomic responsivity in the poliomyelitic patients. However, the skin temperature changes on the part of these patients is not completely congruent with the above indicated trend and requires additional exploration.

Microfilm \$2.50; Xerox \$7.20. 155 pages.

JUDGE PERSONALITY AND FAVORABILITY BIASES IN INTERPERSONAL PREDICTIONS

(L. C. Card No. Mic 59-5580)

Lois Sauté, Ph.D.

The University of North Carolina, 1959

Supervisor: June Elizabeth Chance

The major question investigated in the study was whether sensitizers and repressors were both biased toward personally favored alternatives in making predictions for peers but would show different favorability biases in their self descriptions and in the predictions expected for self.

Welsh's Anxiety (A) and Repression (R) Scales, the need dominance (*n dom*) and need aggression (*n agg*) scales from the Edwards Personal Preference Schedule, and the California F Scale were administered to male undergraduate psychology students. Students were asked to respond to the *n dom* and *n agg* scales first as they really were and then as they would ideally like to be.

Sensitizers were defined as Ss scoring in the extreme upper end of the distribution of A scores and in the extreme lower end of the distribution of R scores. Repressors were defined as high scorers on R and low scorers on A.

Distributions were made of the number of dominance and aggression alternatives selected by each S in his ideal self description. Subjects at the extreme upper ends of the distributions were classified as favorable toward dominance or aggression. Similarly, Ss at the lower extremes of the distributions were classified as unfavorable toward dominance or aggression.

Subjects were assigned to the experimental session in pairs. Favorability toward the needs was held constant for any given pair but the sensitizer-repressor classification was varied. A total of 68 Ss participated in the experiment: 37 repressors and 31 sensitizers.

In the experimental session, each pair discussed for 20 minutes their differences in opinion about statements on the F scale. Each member of the pair was then asked to respond to the two need scales as he believed his partner had (a) described himself (b) predicted that he responded. Following completion of these predictions, each alternative on the two need scales was presented singly, rather than as a forced choice between pairs as they had previously been presented, and each S was asked to indicate for each alternative whether it seemed to him a primarily favorable, neutral, or unfavorable statement to make about one's self.

Favorableness of the various descriptions and predictions was assessed by counting the number of alternatives in the descriptions and predictions that were the same as alternatives S had selected in his ideal self description.

The main findings were that:

1. Both repressors and sensitizers tended to predict that others would choose alternatives to describe themselves that they themselves had selected in their own ideal self descriptions.
2. Repressors chose more ideal alternatives to describe themselves than did sensitizers. Both repressors and sensitizers chose more ideal alternatives to describe themselves than they predicted for others or expected others to predict for them.

3. Both repressors and sensitizers expected their partners to predict for them about the same number of ideal alternatives that they themselves had predicted for their partners.

4. Following from the above results, repressors chose more ideal alternatives to describe themselves than were predicted by their partners more often than did sensitizers. Also, repressors chose more ideal alternatives to describe themselves than they predicted for their partners more often than did sensitizers.

It was concluded that both repressors and sensitizers are biased toward personally favored alternatives in making predictions for peers. As predicted, repressors are more biased toward the selection of personally favored alternatives in their own self descriptions than are sensitizers. Contrary to prediction, repressors and sensitizers do not show different biases in the favorableness of the predictions they expect from others. However, relative to the favorableness of their self descriptions, repressors expect less favorable predictions from others than do sensitizers. Further investigation of the relationship between favorability of expected predictions and kinds of impressions that have been formed about the judge was recommended. Microfilm \$2.50; Xerox \$5.60. 115 pages.

SOME EFFECTS OF REWARD AND PUNISHMENT ON VISUAL PERCEPTION

(L. C. Card No. Mic 60-703)

Philip Alden Smith, Ph.D.
University of Kentucky, 1955

Supervisors: Dr. Graham B. Dimmick
Dr. Ernest Meyers

In the past ten years psychologists have witnessed a growth of theory and research dealing with motivational aspects of perception. Some writers have suggested that perception may be autistic, to some extent shaping our knowledge of the world in accordance with our wishes. The claim has been made that anxiety may intervene between sensory discrimination and conscious awareness, altering the perception of objects threatening to the observer. Other writers have held that newly elucidated relationships between personality and perception, where valid, could be subsumed under older, well established psychological principles. The present study served as a test of some portions of a theory which holds promise of ordering our knowledge of motivation and perception into comprehensive and testable form. Specifically, the theory deals with the arousal and strengthening of perceptual response dispositions for certain stimuli, based upon the nature of the past experience with these stimuli.

In the present investigation, some of these theoretical formulations were put to test by experimentally inducing positive (rewarding) and negative (punishing) value in controlled lists of initially meaningless stimuli. Four groups of college students, matched for learning ability, learned a list of nonsense words to a criterion of perfect recall. The words were varied along a continuum of frequency of presentation. During learning a reward group was given repeated one cent rewards according to a prearranged

order; a punishment group was given painful electric shocks according to the same order; an emphasis group was administered a neutral reinforcer; and a control group learned with no accompanying reward, punishment, or emphasis. Following the learning task, all subjects' visual recognition thresholds for the learned material and for additional unfamiliar material were determined. Estimates of the meaning (value, potency, and activity) of the learned words were also obtained.

The results of the experiment may be broadly summarized as showing that conditions of reward, punishment, and emphasis during learning were effective in producing significant changes in meaning of the stimuli used, corresponding to the rewarding, punishing, or emphasizing nature of reinforcement. However, reinforcement was ineffective in producing differences in learning or differences in recognition of the stimuli. Differential frequency of presentation led to differences in learning, but no corresponding differences in recognition were found. Recognition of unfamiliar stimuli was relatively delayed. The results were interpreted as indicating that theoretical formulations concerning the strengthening effect of reinforcement on perceptual response dispositions need revision and elaboration. They offered no support for hypotheses of perceptual defense, vigilance, or sensitization. A discussion of the results in relation to psychopathological disturbances of perception was offered.

Microfilm \$2.50; Xerox \$6.80. 142 pages.

COLOR SHOCK ON THE RORSCHACH TEST

(L. C. Card No. Mic 60-706)

Mac Edward Sterling, Ph.D.
University of Kentucky, 1950

Three questions seem outstanding as the ones that must be answered if a more workable knowledge of the Rorschach test is to be gained. They are:

1. Is the observed behavior disturbance, referred to as "color shock," a consequence of the color experience or is the effect due to some other determinant of the inkblot?
2. If the hue does evoke disturbance, are certain colors more potent in arousing difficulties than others? What are these colors?
3. Irrespective of which determinant of the blot is more provocative, be it form, shading, color or a combination of these, which areas of the colored blots are more difficult to delineate and form percepts to?

The present research has hoped to more clearly separate the determinant, color, from the other aspects of the blots and to answer these questions more decisively than has heretofore been done.

The results of this research gave rise to some theoretical possibilities in the explanation of the specific action of the color. The flesh-like color arouses associations of flesh and in those areas whose form and shading have already aroused sexual associations, the color brightens the reality of the percept. Rather than being the incongruity of the form and color, as suggested by Siipola, it

seems to be the congruity which emotionally arouses individuals. With neurotics who have complexes rooted in sex preoccupations and subsequent guilt feeling over such concern, memory engrams of flesh and blood are too complex-laden to be handled smoothly. Just as words in word association tests tap the complexes, the memories of colors arouse and stir exactly the same type of association.

Contributions to the Knowledge of the Rorschach Test

In the general use of the Rorschach Test with neurotic patients, an observable disturbance in performance occurs when the colored cards are presented. There are many possibilities as to what is causing the impairment. It could be the form, shading, color, or a combination of these. In the past, because of the place of occurrence of the shock reaction, Rorschach and his workers have called the reaction "color shock," assuming that the hue of the blot was largely responsible for the disturbance. A response to the blot is the end result of a complex interplay of associations so that to determine the specific effects of any one element is a difficult problem. In this experiment, through the use of an unusual procedure and special sets of cards, it seems that the problem has been met and the color influence has been isolated. The other determinants of the blots were equated so that the color became the experimental variable. The results of such an analysis confirms Rorschach's assumption that color is a real contributing agent in evoking the phenomenon of "color shock".

It was also disclosed in this research that those persons who do not use color as part of their percepts are the ones in whom the color arouses the most disturbance. It was shown that avoidance and constriction are characteristic of these people.

A further result which casts a shadow of doubt on some of the present theories explaining the action of the color, is the uncovering of the relatively dull, red hue of areas D6-IX and D9-X as the most provocative color of all the colors included in the standard set of Rorschach cards.

It is also interesting that the colored areas ranking highest in shock in this paper are referred to in the literature as being popular sexual areas. These results suggest the strong possibility that the manner in which color acts as a provoker of shock is by contributing to the reality of the sexual and complex laden associations which were aroused by other aspects of the blots.

Microfilm \$2.50; Xerox \$5.00. 97 pages.

THREE ATTITUDE SCALES IN RELATION TO THE ACADEMIC ACHIEVEMENTS OF MALE COLLEGE FRESHMEN OF MODERATE ACADEMIC POTENTIAL

(L. C. Card No. Mic 60-542)

Walter Russell Stevens Jr., Ph.D.
Michigan State University, 1958

Major Professor: Albert I. Rabin

Three five-item attitude scales were empirically derived from the responses made to 135 rating-scales by 63 unmarried, white, male college freshmen, students who had displayed moderate academic aptitude on the Michigan

State University Freshman Orientation Test Battery (the MSU English Placement Test, the MSU Arithmetic Proficiency Test, the "Quantitative" and "Linguistic" scores of the ACE Psychological Examination--1940 edition, and the "Vocabulary" and "Comprehension" sections of the MSU Reading Test). All the rating-scales had been selected by the writer and three other counseling psychologists as logically representative of universally-experienced aspects of college life. Each of the scales met criteria for unidimensionality, and scalability was largely confirmed in cross-validation.

The attitude scales were labelled as representing:

(a) Institutional Identification, the extent to which a student considers the academic enterprise to be compatible with his own needs and aspirations; (b) Self-Confidence, the degree to which the student feels comfortable--even stimulated--in his performance of the student role, particularly of its more public aspects; and (c) Achievement Valuation, the extent to which working for recognition and enjoying positions of prestige are considered worthwhile by the student.

Comparisons were made between students' scores (scale types) on the attitude scales and their cumulative grade point averages (CGPA) for three terms of the freshman year (with a minimum of 42 course credits carried and a minimum of 39 credits earned). No statistically significant relations (coefficient of contingency) were found between the attitudes and achievement, either when the attitude scores were combined in various three-scale or two-scale profiles or when they were individually compared with the achievement criterion. The small size of the sample and the unreliability of the achievement criterion probably contributed to the essentially negative results.

The strongest relationship was that between low (scale types 0 and 1), moderate (scale types 2 and 3), and high (scale types 4 and 5) Self-Confidence Scale (SCS) levels and low (below 2.15), moderate (2.15-2.54), and high (above 2.54) CGPA levels. The obtained .325 contingency coefficient was significant at the .12 level of confidence. High achievement was associated with moderate self-confidence; moderate achievement, with low self-confidence; and low achievement, with high self-confidence. Knowledge of SCS levels increased efficiency of forecasting CGPA levels by 30.4 per cent beyond that obtained without such knowledge. Although the statistic may not have been fully justified, a curvilinear regression of CGPA on SCS scale types was computed and reported ($\eta^2 = .473$, significantly greater than zero at the .01 level).

When the distribution of three-scale attitude patterns was superimposed on the low, moderate, high three-by-three contingency table comparing SCS level and achievement level, a number of interesting trends appeared. The trends were not worth testing statistically because of small sample size, but may be worth pursuing with further research. The observed pattern trends failed to support the widely-held contention that optimally-achieving students (high-achievers) are inclined toward exaggerated identifications with authority-figures. Most students with attitude patterns commensurate with such identification were low-achievers. Conversely, among the high-achieving students the majority exhibited patterns essentially contradictory to such identification. The only students with patterns in keeping with the "identification" thesis who were found achieving above the lowest level were those

with SCS scale types 0 or 1. It was suggested that this last group of students is perhaps more typical of counseling center and psychological clinic clientele than of students in general, thus possibly accounting for the inclination of many clinically-trained personnel to predict high achievement for most students with strong tendencies toward identification with authority-figures.

An attempt was made to explain the trends in terms of the concepts of "feelings of personal inadequacy," "defensiveness" v. "tolerance," and "premature identification" v. "independence and flexibility." Optimal achievement for the students of the sample was viewed as symptomatic of an essentially realistic awareness of and tolerance for self and surroundings, with no particular concern for the conventional signs and symbols of prestige per se. Failure to achieve was seen as a concomitant of: (a) premature narrowing of interests (relative to the demands of first year liberal arts curricular requirements); (b) a straining after relatively superficial appearances of academic success as compensation for felt but poorly tolerated personal inadequacies; and/or (c) genuine satisfaction with the personal status quo such that no need to strive is felt. Further research was recommended to test the very tentatively-held and essentially *ad hoc* inferences of the present study. Microfilm \$2.50; Xerox \$6.40. 133 pages.

THE RELATIONSHIP BETWEEN SELF-ACCEPTANCE AND ACCEPTANCE OF OTHERS: A LEARNING THEORY ANALYSIS.

(L. C. Card No. Mic 59-6904)

Richard Michael Suinn, Ph.D.
Stanford University, 1959

The purpose of this study was to examine the variables influencing the relationship between self-acceptance and acceptance of others. For convenience, the term self-satisfaction will be used instead of self-acceptance. From a learning theory analysis, it was predicted that the relationship would increase as a function of a) increased perceived similarity, b) increased self-dissatisfaction, c) increased involvement with the other person, and d) the type of defense used.

Each of 82 male high school seniors was asked to describe his teacher, father, and self with Q-sort decks prepared for this purpose. From the Q-sortings it was possible to obtain the following scores for each subject: self-satisfaction score, father-satisfaction score, teacher-satisfaction score, self-father similarity score, and self-teacher similarity score. The satisfaction scores indicated the degree to which the subject was satisfied with himself, his father, and his teacher. The similarity scores indicated the degree to which the subject perceived himself as similar to his father, and as similar to his teacher. From these scores it was possible to obtain the following correlation coefficients: father-generalization coefficient, teacher-generalization coefficient, father-discrepancy coefficient, and teacher-discrepancy coefficient. The father-generalization coefficient indicated the degree to which self-satisfaction scores correlated with father-satisfaction scores; the teacher-generalization coefficient indicated the degree to which self-satisfaction scores

correlated with teacher-satisfaction scores. The father-discrepancy coefficient indicated the degree to which perceived similarity affects the correlation between self-satisfaction and satisfaction with father; the teacher-discrepancy coefficient indicated the degree to which perceived similarity affects the correlation between self-satisfaction and satisfaction with teacher. For the discrepancy correlations, a high negative correlation indicated that similarity highly influences the relationship between self-satisfaction and satisfaction with others.

The following summarizes the specific predictions and results:

Prediction 1a. There will be a positive correlation between degree of self-satisfaction and satisfaction with father. This prediction was confirmed at less than the .005 level of significance ($r = .32$).

1b. There will be a positive correlation between degree of self-satisfaction and satisfaction with teacher. This prediction was confirmed at less than the .02 level ($r = .25$).

Prediction 2a. There will be greater generalization of self-satisfaction as perceived similarity between self and father increases. This prediction was confirmed at the .05 level of significance (discrepancy correlation = $-.24$).

2b. There will be greater generalization of self-satisfaction as perceived similarity between self and teacher increases. This prediction was confirmed at the .002 level (discrepancy correlation = $-.34$).

Prediction 3. There will be greater generalization for Ss highly dissatisfied with themselves than for Ss highly satisfied with themselves. The F ratio of the variances did not support this prediction.

Prediction 4. There will be greater generalization of self-satisfaction towards fathers than towards teachers. A "t" test of the difference between the father-generalization coefficient and the teacher generalization coefficient was not significant.

The following conclusions and predictions for future study were made:

1. It is possible to study the relationship of self-acceptance and acceptance of others in learning theory terms.

2. Generalization of self-attitudes occurs towards specific social objects such as fathers and teachers.

3. One variable which influences the generalization of self-acceptance is degree of perceived similarity.

4. Future study could profitably focus on:

a) the degree of generalization to specific social objects, e.g., parents, teachers, friends;

b) the specific variables influencing such generalization;

c) the relationship between age, stability of self-concepts and generalization;

d) the use of stability of the self-concept as an index of stage of adolescent development.

5. Future study with adolescent subjects could profitably test the following hypotheses:

- a) adolescents show greater involvement with teachers than with parents and resist involvement with parents;
- b) adolescents show greatest involvement with peers;
- c) generalization of self-acceptance towards others is less for adolescents than for adults because of unstable self-concepts of adolescents.

Microfilm \$2.50; Xerox \$6.20. 126 pages.

AN INVESTIGATION OF THE PSYCHOANALYTIC THEORY OF HOMOSEXUALITY

(L. C. Card No. Mic 60-712)

Richard Wallace Thomas, Ph.D.
University of Kentucky, 1951

This dissertation is an investigation of psychoanalytic theory in regard to active and passive homosexuality.

The experimental group consisted of forty overtly homosexual, male veterans of World War II. The homosexuals were divided into active and passive homosexual groups on the basis of their performance for the active or passive role in intercourse.

The control group consisted of twenty hospitalized, male veterans of World War II. These men showed no homosexual content on their Rorschach Tests.

The two groups were administered the short form of the Minnesota Multiphasic Personality Inventory. The only scale of the Inventory considered for this investigation was the masculinity-femininity interest scale. The other test administered was the modified projective technique called the Blacky Test. This technique was designed to investigate the following psychoanalytic concepts: oral eroticism, oral sadism, anal expulsiveness, anal retentiveness, Oedipal intensity, masturbation guilt, castration anxiety, positive identification, sibling rivalry, guilt feeling, positive ego ideal, narcissistic love object, and anaclitic love object. Because the Blacky Test is not a clinically validated instrument, this investigation can only be said to support or disagree, as the case may be, with psychoanalytic theory.

The results of the Blacky Test will be considered first. The concepts are presented in the same order as given above:

1. Theory states that all homosexuals have regressed to the early oral stage of psychosexual development. This investigation does not support this theory.
2. Active homosexuals showed a marked disturbance at the oral sadistic level.
3. There was no hypothesis made from theory concerning anal expulsiveness.
4. Theory states that passive homosexuals are fixated at the anal stage. Since the aim of anal retentiveness is more passive than in anal expulsiveness, it was hypothesized that they would show disturbance at the anal retentive phase. This investigation supports the hypothesis.
5. Theory states that one of the important causes of homosexuality is an inadequately resolved Oedipal complex, which persists as Oedipal intensity. This investigation supports the theory.

6. It was hypothesized from psychoanalytic theory that active homosexuals would show masturbation guilt. This investigation does not support the hypothesis.

7. Psychoanalytic theory states that castration anxiety is a very important consideration in the etiology of homosexuality. It is the castration anxiety which causes a homosexual man to choose another man for a love object. This investigation does not support the theory.

8. Theory states that homosexuals have a feminine identification instead of a masculine identification. That is, they show a negative identification instead of the normal positive identification. This investigation supports the theory.

9. Psychoanalysis theorizes a special type of homosexuality caused by intense sibling rivalry. Hatred toward the older sibling is overcompensated into love and results in homosexuality. Evaluation of the results of this investigation with theory is not possible.

10. It was inferred that homosexuals would show disturbance in the area of positive ego ideal. This inference was made because homosexuals show difficulty in the resolution of the Oedipal complex and in positive identification. This investigation supports the inference for homosexuals as a group.

11. Theory states that active homosexuals choose narcissistic love objects. This investigation shows that active homosexuals, to a statistically significant degree, chose more narcissistic love objects than did the passive homosexuals.

12. Psychoanalytic theory states that passive homosexuals choose anaclitic love objects. This investigation supports the theory.

13. Theory states that passive homosexuals act and feel like women. Therefore, they should reveal marked feminine interests on the Mf scale of the MMPI. This investigation supports the theory.

14. Theory states that active homosexuals are men in every respect and there is nothing effeminate about them. This investigation does not support the theory.

Microfilm \$2.50; Xerox \$7.80. 167 pages.

THE RELATIONSHIP OF ANXIETY AND REPRESSION TO PERCEPTUAL PREDOMINANCE OF THREATENING STIMULI

(L. C. Card No. Mic 59-5588)

Robert Leon Van de Castle, Ph.D.
The University of North Carolina, 1959

Supervisor: W. Grant Dahlstrom

This study was designed to investigate whether some hypotheses derived from perceptual defense theory could be verified in a binocular rivalry situation.

Pairs of stimulus words were exposed for a one second interval in an Engel stereoscope and subjects were required to record which member of the stimulus pair was perceptually more predominant. An objective scoring system was designed to weight differentially the various responses for degree of predominance. All words not correctly spelled were considered nonsense words. Two experimental lists of stimulus words (A and B) were constructed of stimulus pairs that were equated for several

structural characteristics as well as for frequency of usage. The crucial stimulus pairs contained an aggressive word and a neutral word, with the remaining filler items consisting of pairs of neutral and nonsense words.

Compensations for differential visual dominance and acuity between the two eyes were provided by controlling the illumination level of each eye separately. These illumination levels were established on an initial list of neutral words; the focusing distance providing maximum clarity for each subject was also obtained at this time.

The subjects were selected on the basis of objective personality scales. They were classified as sensitizers if above the mean on Welsh's Anxiety (A) Scale and below the mean on Welsh's Repression (R) Scale and as repressors if above the mean on the R scale and below the mean on the A scale. In addition, the subjects were also selected on the basis of being above or below the mean on the aggression scale of the Edward's Personal Preference Schedule (EPPS). Equal numbers of high and low aggressive subjects were included in the sensitizer and repressor classifications. Each of the four personality classifications contained 7 males and 3 females.

After initial apparatus adjustments, each subject was presented an experimental list of stimulus pairs (Trial 1) followed by a modified Rorschach Test containing 20 aggressive and 20 neutral percepts. Half of these percepts had acceptable form quality (F+), half had unacceptable form (F-); each subject was required to judge whether the percepts could resemble the areas pointed out on the ink-blot. After the Rorschach task, each subject was told he had done poorly regardless of his actual performance on this task. Then he was immediately presented the second experimental list (Trial 2). Lists A and B were counter-balanced in order of presentation.

The following major results were found:

- 1) Sensitizers reported significantly more aggressive words in the binocular rivalry situation than repressors in Trial 1. This difference was not significant for Trial 2.
- 2) Sensitizers reported significantly fewer nonsense words to those stimulus pairs containing an aggressive word than did repressors.
- 3) A significant difference was found on Trial 1 between the two experimental lists in their ability to elicit aggressive responses. This difference was not significant on Trial 2.
- 4) Individual variability was significantly greater on Trial 1 than on Trial 2.
- 5) Sensitizers accepted significantly more aggressive and neutral F- Rorschach percepts than repressors.
- 6) Repressors denied significantly more F+ aggressive Rorschach percepts than sensitizers.
- 7) A Rorschach difference measure (F+ aggressive-F- aggressive percepts) had a significant correlation of $-.49$ with perception of aggressive words on Trial 1 and an insignificant correlation of $-.15$ with Trial 2.
- 8) No significant relationships with the perception of aggressive words or with Rorschach percepts was found for the EPPS aggression scale.

These results were discussed in terms of related findings from other studies in the perceptual defense area. It was concluded that Welsh's A and R scales are primarily related to the manner in which subjects structure an initially ambiguous situation. It was suggested that the use of these scales, particularly in combination with the Rorschach measures, should prove valuable in future studies in this area. Microfilm \$2.50; Xerox \$5.60. 111 pages.

AN EXAMINATION OF PROCESSES OCCURRING IN TWO METHODS OF GROUP PSYCHOTHERAPY WITH SCHIZOPHRENICS

(L. C. Card No. Mic 60-715)

Leo Charles Ward, Jr., Ph.D.
University of Kentucky, 1954

Supervisor: Dr. James S. Calvin

The primary purpose of this study was to describe, analyze and compare processes and results occurring in group psychotherapy with schizophrenic patients when two different methods are employed. Other objectives were to obtain a tentative answer as to the relative merits of the two defined therapeutic techniques used and to compare therapy to non-therapy.

Three groups, two experimental and one control, with ten patients each, were selected. They were matched on the basis of the Hospital Adjustment Scale, Physician's Evaluation Scale and Roberts Stick-Men Test. Additional tests were administered in order to obtain data for pre- and post-estimates of patients' psychiatric conditions. The two experimental groups then were given group psychotherapy for a period of six weeks, 5 days a week. One therapist used a "non-restrictive" method, i.e., he "followed" the patients, attempting only to "clarify," to "reflect" and to create a permissive atmosphere. The other therapist, using a "restrictive" method, attempted to get the patients to accept the roles of patients with problems. His role was one of clarifying, instructing, evaluating and "rewarding" and "punishing."

Comparisons of pre- and post-evaluations of the extent and severity of pathology, hospital adjustment and the psychological organization of the patients were made. The results suggest that in terms of severity and extent of pathology, both experimental groups "improved" over the control.

In terms of hospital adjustment, the group in which a "restrictive" method was used showed statistical significance in "improvement" from the first to the second evaluation and showed "improvement" approaching statistical significance over the control group, which also showed "improvement" approaching significance. The "non-restricted" group showed very little "improvement." An analysis of the HAS shows that the items of ward behavior on which the control group "improved" were those which only made "better hospital patients," i.e., were items which might not be considered therapeutic goals. Those items on which the "restrictive" group showed "improvement" might be considered, for the most part, therapeutically desirable.

The judgments of the psychologists as to the relative condition of the groups showed neither group to have significantly "improved" nor to have become "worse" in relation to each other or to the control group.

In an attempt to describe and analyze the therapy processes, several methods were employed. The most important was the modification of Bales' Interaction Process Analysis. Quantitative methods were also used, such as, word counts for patients and therapists, type/token ratios, percentage of patient-to-patient interactions, etc. The results showed the ways in which the activities of the groups were different and that the activities of the therapists were different and generally in accordance with their respective intentions. It appeared that the "non-restrictive"

group had more verbal activity and more psychotic activity than the "restrictive" one. Both groups showed an increase of aggressive behavior through time but in the "non-restrictive" group, it appeared to be largely delusional; whereas, in the "restrictive" group, it was group-oriented and realistic most of the time. The "non-restrictive" group apparently became "freer and freer" with less ego-control in the dominant members and less group organization. The other group seemed to be slowly developing a group-centered, problem-solving attitude, an attitude of patients with problems.

The data suggests that the question whether "therapy is 'better' than non-therapy" is perhaps unanswerable in this form. It seems necessary to specify the type of therapy before such generalizations can be made.

Microfilm \$2.50; Xerox \$7.00. 149 pages.

A STUDY OF THE RELATIONSHIP BETWEEN ANXIETY, THIRST AND ACCURACY OF PERCEPTION OF THIRST-RELEVANT OBJECTS.

(L. C. Card No. Mic 60-716)

Eric Weingarten, Ph.D.
University of Kentucky, 1954

Supervisor: Dr. Charles F. Diehl

Recent investigations have reported data which have been interpreted as supporting the assumption that total effective drive-level, as measured by certain aspects of performance, is determined to a certain extent by "irrelevant needs" which are not themselves reduced by the performance which is being studied. Anxiety, as measured by a questionnaire score, is one of these irrelevant needs which supposedly have the effect of increasing the total effective drive-strength of the organism.

Other investigations have reported findings indicating a positive relationship between the intensity of a need and certain aspects of the perception of external objects which are relevant to that need. One of the psychophysical measures which has been shown to vary with the intensity of a primary need has been the positive time-error of illuminance matches of slide-images of need-relevant objects.

The assumption was made that the concept of total effective drive strength could meaningfully be applied to the area of need-relevant perception. It was hypothesized that the presence of an "irrelevant need" such as anxiety, in addition to a primary need, would lead to an enhancement of a perceptual effect which is a function of the primary need. The perceptual effect which was selected for study was the positive time-error in illuminance matches of slide-images of need-relevant objects.

Subjects scoring high and low on a questionnaire measure of anxiety were compared on the accuracy of their illuminance matches of slide-images depicting glass containers filled with water, milk and orange juice. Each subject made four series of matches at individual laboratory sessions separated by four-hour intervals. Approximately one half of the subjects abstained from either solid or liquid nourishment for the entire twelve hour period spanned by the experiment and were therefore progressively more thirsty at each session. The other subjects

ate and drank normally and in addition took a drink of water just before each experimental session. There was an approximately equal distribution of subjects with high and low anxiety scores in the thirsty and the non-thirsty groups.

It was predicted that high-anxious individuals would show a greater time-error effect as a function of time of deprivation than low-anxious individuals.

The findings up to the third session, which corresponds to eight hours deprivation for thirsty individuals, are compatible with the prediction; the predicted time-error effect was found only with high-anxious individuals. This effect disappeared beyond eight hours deprivation; this change in trend cannot be conclusively accounted for on the basis of the data. It is possible that it reflects cyclical aspects of primary needs.

Although the obtained differences in "need-relevant perception" may be interpreted as reflecting differences in total effective drive strength between the high-anxious and low-anxious groups, alternative explanations are possible. Differences between high-anxious and low-anxious individuals in susceptibility to the perceptual distortion effects of inner needs may be hypothesized which could account for the obtained results without the necessity of assuming differences in total effective drive-strength. It is possible, also, that an important factor in leading to the obtained differences between high-anxious and low-anxious individuals is a tendency of performance to deteriorate at excessively high drive-levels, as contrasted with a gradual improvement with practice at lower, more optimal drive-levels.

Microfilm \$2.50; Xerox \$3.80. 68 pages.

"HEIMWEH" OR "NOSTALGIC REACTION": A CONCEPTUAL ANALYSIS AND INTERPRETATION OF A MEDICO-PSYCHOLOGICAL PHENOMENON.

(L. C. Card No. Mic 59-6908)

Charles (Karl) Arthur Alfred Zwingmann, Ph.D.
Stanford University, 1959

Exploratory and theoretical, the present investigation had as main-objective the critical appraisal and re-evaluation of a behavior dimension which has been neglected in the psychological and psychiatric literature. Criteria for the validation of the rationale were secured from professional writings.

PART ONE consisted of a chronological analysis and evaluation of the international "nostalgia" literature as it fell within the linguistic competence of the writer.

The conceptual root of the phenomenon was traced to the ancient notion "melancholia", but more directly it was found to be related to the German vernacular designation "Heimweh", which seems to have originated in the sixteenth century. Under this name it was reported to have been a serious disease typical among Swiss mercenaries fighting for the despots of Europe. However, as a formally described medical pathology it was introduced under the name "nostalgia" in 1688, by the Swiss physician J. Hofer.

The eighteenth century saw the concept, also known as the "Swiss Disease", rise to international popularity, and the peculiar sound-modulations called "Kühreihen" became intimately associated with the phenomenon as a

precipitatory circumstance. Etiologically, nostalgia was believed to be related to air pressure differentials, confusion of animal spirits, entanglement of nerve fibers, *et cetera*. Symptoms ranged from hectic fever to diarrhea, delusions, and convulsions. Therapy consisted, among other things, of the administration of hypnotic emulsions and emetics, bleeding, purging, and torture-insomnia. Around 1756 the phenomenon appeared for the first time in England, under the label "homesickness".

In nineteenth century France, nostalgia or "*la maladie du pays*" was described as a typical disease of the Napoleonic battlefields in Africa and Russia, and "proven" on the basis of autopsy reports. Tissue-inflammations and even bumps on the patients' heads were identified as signs of the nostalgic disease.

During the same era German physicians became interested in *Heimweh* as a motive for crime (initially in association with pyromania), characteristic in premenarcheal or menstrually disturbed girls.

In America nostalgia made its debut as a disease of the battlefields of the Civil War, and at the end of the century it was investigated, at Clark University, in relation to the homing instinct in animals.

Of the major nations under discussion it was primarily in Germany and the United States that the phenomenon was shown some interest during the present era. In Germany it remained largely a psychiatric monopoly dominated frequently by constitutional degeneracy notions, and children as subjects of attention; in America both psychological and psychiatric authorities took cognizance of the phenomenon, with students and soldiers as prime objects of attention.

The synthesis of PART ONE included, among other things, a rejection of the concepts "nostalgia" and "homesickness" because, residually obsolete, they are suggestive of a disease entity, and a goal of longing which is not necessarily representative of the dynamics of the condition.

PART TWO, INTERPRETATION was introduced with an answer to the titular question, in form of an adoption and definition of "nostalgic reaction", (hitherto referred to as n.r.):

An individual's response to change and/or an abstraction thereof (anticipated change) by a symbolic return to, or reinstatement of, those features of his past Erlebnisraum which are perceived as having (had) the greatest gratification value.

The rationale was developed on the basis of *Raumprogression*, conceptualized as proceeding along (1) the organic (deterioration) coordinate which is irreversible, (2) the psychological (projection) coordinate which is reversible.

The n.r. is the consequence of change perceived as threatening (obstacle) the *Raumstruktur*, i.e. it consists of a reversal of an essentially antrojective (futuristic) ego-gratification to a retrojective (past) gratificational emphasis. Hence the n.r. was identified as "retrospective-ego-involvement" and considered normal to the extent to which it assures affective continuity and constitutes an aid during the crisis of cognitive acclimatization. Pathological reactions are indicated by duration, frequency and intensity of the nostalgic episodes as well as their psychological and somatic concomitants.

The n.r. was differentiated against "separation anxiety". More specific than the latter, the n.r. presumes cognitive participation, its objective (a gratificational high-

point of the past *Erlebnisraum*) is identifiable; therefore psychoanalytic interpretations with the mother's womb or the father's penis as unconscious objectives of nostalgic longing were found unacceptable.

The reaction-dynamics of the n.r. to physico-spatial change were discussed on hand of a topological model. Communicational aspects, qualitative and quantitative, were taken under consideration.

Physico-temporal change as antecedent and essentially endogenous criterion of the n.r., (dimension completely neglected in the literature) was brought under critical focus. Utilitarian (materialistic) culture standards were believed to be prime determiners of the n.r. Examples of the fear of time-lapse in relation to psycho-physical auto-perception (deterioration coordinate and its epiphenomena) were presented. The n.r. tends to be culturally discouraged because "uneconomical".

The concept "nostalgic illusion" was introduced with reference to retrospective modifications of the *Erlebnisraum*. Hostility and overt aggression (obsessive-compulsive) accompaniments of the n.r. were related to lack of empathy (withdrawal of affect from present and future). The nostalgic *Fremdheitsgefühl*, suicide as a failure of the n.r. process, and the problem of guilt found consideration. A nostalgic ethnocentric correlation was hypothesized.

The concept "nostalgic paradox" was proposed to denote the contradiction in feeling-tone. Cues, cue-threshold and contrast tolerance were elaborated.

Personality antecedents were discussed under restrictions of the *Lebensraum*. Reaction-types were distinguished in terms of (1) predominantly object and milieu-bound individuals, (2) predominantly abstract (materially or immaterially) oriented individuals.

The n.r. was differentiated against parallel phenomena and justified as a diagnostic category. The attitude toward n.r. was found to be an important feature of the nostalgic syndrome.

Suggestions were made with respect to prophylaxis and therapy.

In conclusion it was stated that the professional concern with the n.r. seems to be far out of proportion with its significance as a medico-psycho-logical reaction modality. It was recommended that the nostalgic reaction become more frequently the *Leitmotif* for interdisciplinary research, particularly since the psycho-social (threat) conditions assumed to prompt n.r.'s seem to increase rather than decrease. Not only have intercultural displacements become more frequent, not only have "cold war" methods been added to the customary aftermaths, e.g., refugees, of hot wars, but it may be assumed that the revolution of the cosmic age will force a general revision of the concepts of time and space, therewith force a new dimension on the meaning of isolation, and consequently bring the nostalgic reaction into a more urgent perspective.

Microfilm \$4.50; Xerox \$15.75. 349 pages.

PSYCHOLOGY, EXPERIMENTAL

OPERANT CONDITIONING IN HUMANS
UNDER CONDITIONS OF DISTRACTION
AND LACK OF DISTRACTION

(L. C. Card No. Mic 60-635)

Jean Wallace Branson, Ph.D.
University of Kentucky, 1954

Supervisor: Dr. Graham B. Dimmick

This study was begun in an attempt to provide additional data relative to the problem of whether human subjects could be conditioned under circumstances in which the response of the subjects was followed by primary reinforcement but the act or response which preceded the reward did not involve manipulation of the environment, the subjects did not do anything with the reward after they got it in the sense that eating food or drinking water is an activity of this sort, and the attention of the subjects was diverted from the reinforcing stimulus.

Two groups of subjects served under the following conditions: Group I was studied under conditions in which the subjects were asked merely to sit in the experimental room in which the temperature was 120° Fahrenheit and were not given any tasks to perform; Group II was placed in a situation exactly the same as that of the first group but were given simple work tasks to perform. Twelve male college students participated in the experiment, with six subjects in each group.

During the early part of the experiment, a specific movement of each subject was selected as the response to be rewarded, and, later in the experiment, each time the subjects made this movement, they were rewarded with a current of cool air for a five second period. No auditory or visual cues were operative.

The results of the experiment answer the following questions: (1) Will conditioning occur when the occurrence of an operant is followed by a reinforcing agent if the subject does not manipulate the environment actively and does not do anything with the reinforcement after he gets it? (2) Is it possible to establish conditions under which an operant which is contiguous with need reduction will not be conditioned? Both of these questions were answered in clearcut and affirmative terms by the results of the data. Every one of the subjects in the task group showed statistical evidence of conditioning. During the extinction period, all of the conditioned subjects showed a decided decrease in the frequency of response. This decided decrease was not shown by the unconditioned subjects. The means of the frequency of response of the two groups of subjects were compared for each day of the reinforcement period. The differences between means of the two groups were found to be statistically significant at the .01 level for each of the last nine of the total ten days of reinforcement. Implications of these results were discussed in the framework of the reinforcement theories propounded by Clark L. Hull and B. F. Skinner.

The requisite for conditioning in this experiment appears to be concerned with the cognition of the relationship between the response and the reinforcing agent. However, cognition, from an introspective standpoint, was at a low level for both groups. This would suggest that there is need for further study of the importance of cognition as a factor in instrumental conditioning. Microfilm \$2.50; Xerox \$4.80. 93 pages.

RATIO REINFORCEMENT OF THE
SUPERSTITIOUS MAND IN VERBAL BEHAVIOR

(L. C. Card No. Mic 60-725)

Robert Keith Branson, Ph.D.
The Ohio State University, 1959

The purpose of these experiments was to investigate the possibility that verbal behavior could be controlled and manipulated by inanimate objects not under control of the subject. Two separate experiments were conducted to study different aspects of the problem.

The subjects in these experiments were 155 freshman girl volunteers from elementary psychology classes at the Ohio State University. They were told that the experiment was in Extra-Sensory Perception and that they were to try to influence the outcome of the dice by making a verbal response prior to the toss. There were two basic problems: learning and extinction.

Experiment I was concerned with the effects of tossing a pair of re-spotted dice on the verbal behavior of the dice-tosser. It was hypothesized that the operant level of the different numbers throwable by the dice would be modified after the subject had thrown the dice two hundred times. It was further suggested that there would be no difference whether the operant levels were concerned with speaking or with writing.

It was found that verbal behavior could be manipulated by changing the objective probabilities of certain numbers on the dice. The numbers most frequently said by the subjects were the numbers occurring most frequently on the dice. It was found that there are differences between oral and written responses on this problem. If the operant level is determined by having Ss write "random" numbers, their behavior shows greater changes than if they are asked to recite orally the pre-experiment random numbers.

Experiment II was concerned with the problem of extinction and also served to determine whether the Ss were paying attention to the task at hand. It was hypothesized that Ss would gradually stop calling numbers that no longer appeared on the dice, but would continue to call the numbers which did appear on the dice in agreement with the objective probability of these numbers. It was also hypothesized that Ss who were required to call out both the number they thought the dice would throw and the number that the dice actually threw would learn the problem more quickly than the Ss who were not required to say what the dice actually threw.

It was found that the first hypothesis was confirmed. Ss showed extinction to those numbers that no longer appeared on the dice. It was also found that there was no difference between the two major experimental conditions. Actually saying the point the dice threw was of no reliable importance in this experiment.

It was suggested that objective techniques for the study of verbal behavior are essential if progress is to be made in this area. It was also suggested that the method used here might be a step toward finding an objective way of studying verbal behavior since no appeal is necessary to the "communication of ideas" or other non-operational descriptions of verbal behavior.

Microfilm \$2.50; Xerox \$5.00. 38 pages.

STIMULUS GENERALIZATION AND
DISCRIMINATION ALONG THE DIMENSIONS OF
WAVELENGTH AND ANGULAR ORIENTATION

(L. C. Card No. Mic 60-463)

Charles Miller Butter, Ph.D.
Duke University, 1959

Supervisor: Norman Guttman

The purpose of this study was (1) to compare response rates to stimuli differing from the training stimulus in one and in two dimensions and (2) to describe the quantitative relationships between response rates under these two conditions. Two alternative hypotheses concerning this quantitative relationship are presented. The Discrimination Hypothesis predicts that the generalization decrement resulting from a stimulus changed in two dimensions equals the sum of generalization decrements to stimuli changed in each dimension alone. The Multiplicative Hypothesis predicts that the subject selectively observes each stimulus change and that the probability of response to a stimulus changed in two dimensions equals the product of response probabilities to stimuli changed in each dimension alone.

The subjects, 27 White Carneau pigeons, were trained to peck at a key illuminated by a narrow band of monochromatic light. In subsequent generalization tests, subjects were presented with all combinations of five values of wavelength and five values of angular orientation of the band of light (Exp. 3). Mean response rates to stimuli differing in both dimensions from the training stimulus were consistently lower than mean response rates to stimuli differing in each dimension alone. The Multiplicative Hypothesis predicted response rates to stimuli varying in two dimensions with a fairly high degree of accuracy, while predictions of the Discrimination Hypothesis showed larger errors.

Comparison of the results of two control experiments on generalization along the dimensions of wavelength (Exp. 1) and angular orientation (Exp. 2) with gradients obtained in Experiment 3 discloses that response rates to two angular orientation stimuli are higher when wavelength variations are also present.

Following the completion of generalization testing, subjects in Experiment 3 were given discrimination training involving stimuli differing in angular orientation and wavelength or in each of these dimensions alone. Discrimination learning involving stimuli differing in both dimensions was faster than discrimination learning involving stimuli differing in either dimension alone. Following discrimination training, all subjects were tested for stimulus generalization along one and two dimensions. Predictions of mean response rates on post-discrimination generalization tests were similar to those described previously. However, the Multiplicative Hypothesis' prediction errors on generalization tests following wavelength discrimination training were much larger than its prediction errors in pre-discrimination generalization. Generalization gradients along dimensions on which stimuli were previously discriminated were similar to those reported in past findings. Generalization gradients along previously undiscriminated dimensions were raised at the peak and steepened at most stimulus values.

The validation of the Multiplicative Hypothesis gives support to its assumption that a basic factor underlying

stimulus generalization is an observing response by means of which the subject selectively "attends" to stimuli changed by some discriminable amount. It is thus possible to extend the observing response and similar concepts proposed within the context of discrimination learning to stimulus generalization phenomena. However, on the basis of the results, changes in two assumptions of the Multiplicative Hypothesis are suggested. The predictions of the Multiplicative Hypothesis are also applicable to stimulus generalization following discrimination training, except when discrimination training results in marked shifts in the distribution of response rates. The observing response analysis can also be extended to the results of discrimination training involving stimuli differing in two dimensions and to the effects of reducing the total area of the stimulus on stimulus generalization.

Microfilm \$2.50; Xerox \$6.60. 137 pages.

THE MONONUCLEAR COUNT AS AN INDEX
OF EMOTIONALITY OF THE RAT

(L. C. Card No. Mic 60-637)

Lee Syers Caldwell, Ph.D.
University of Kentucky, 1954

Supervisor: Dr. J. S. Calvin

There is abundant evidence that disturbing stimuli cause certain characteristic changes in the differential white blood cell count of the rat. It has been found, for example, that unusual stimulation typically produces a decrease in the percentage of mononuclear cells in the circulation. The evidence is such as to suggest that this response of the mononuclears might prove useful as a measure of the degree of reactivity of the rat to emotion-provoking stimuli. One of the best validated indicators of emotionality of the rat is its defecatory behavior in an unfamiliar situation. In order to determine whether there is any relationship between these phenomena, the mononuclear changes obtained in two unfamiliar situations were compared to the defecation scores obtained in another unfamiliar situation.

No significant relationship was obtained between the defecation scores and the mononuclear changes, but a significant relationship was obtained between the defecation scores and the normal mononuclear counts. Subjects with high mononuclear counts tended to have low defecation scores, and those with low mononuclear counts tended to have high defecation scores. It was concluded that the normal mononuclear count may be used to differentiate between highly emotional and relatively unemotional rats.

Microfilm \$2.50; Xerox \$4.20. 79 pages.

THE INFLUENCE OF SPATIAL FACTORS ON
STIMULUS GENERALIZATION EFFECTS AS
INDICATED BY A METHOD EMPLOYING
VOLUNTARY RESPONSES

(L. C. Card No. Mic 60-730)

Henry Allen Cross, Jr., Ph.D.
The Ohio State University, 1959

By means of a method of voluntary responses (Brown, Clarke and Stein, 1958; Bass, 1958), the responses of five groups of human subjects were tested for stimulus generalization effects as a function of the spatial placement of the five stimuli employed.

The general failure to obtain typical generalization gradients necessitated two additional studies designed to isolate the factors responsible for the atypical results of the initial experiment.

The general position of the stimulus array in reference to the subject was systematically varied, and, in addition, the possible influence of the location of the "training" stimulus in reference to the "test" stimuli was considered. Subsequently, the possible influence of instructions to subjects was investigated.

These experiments again failed to yield gradients which could unambiguously be attributed to stimulus generalization phenomena.

A fourth experiment varied the method previously employed by assigning differential win probabilities to the four stimuli previously having equal win probabilities. The resulting gradients did not closely correspond to the objective probabilities employed.

It was concluded that the use of the method of voluntary responses in the investigation of stimulus generalization is not without hazard and does not provide information unambiguously interpreted as stimulus generalization.

Microfilm \$2.50; Xerox \$4.60. 87 pages.

AREAS IN THE BRAIN STEM OF THE
HOODED RAT WHICH FACILITATE OR INHIBIT
REFLEXLY INDUCED FLEXION

(L. C. Card No. Mic 58-7216)

Raimond Emmers, Ph.D.
Syracuse University, 1958

The purpose of the study was to investigate the influence of small areas in the lower brain stem on the flexor reflex in the hooded rat. To accomplish this purpose, the Krieg-Johnson stereotaxic instrument was recalibrated for the hooded rat in the weight range from 420 to 480 grams. A stereotaxic atlas was constructed which served as a guide for accurate placement of stimulating electrodes in the rat brain. It also enabled the planning of a systematic exploration of a portion of the brain stem which extends from the dorsal cochlear nucleus to the pyramidal decussations. Bipolar needle electrodes, separated 0.9 millimeters at their tips and oriented by the stereotaxic technique, were used to stimulate areas of the brain stem at millimeter distances with a 60 cycle alternating current. A current between 0.01 and 0.9 volts was sufficiently strong to produce modification of reflexly induced flexion.

Since the commonly used anaesthetics proved to be inadequate for the experiment, decerebrate preparations were employed. The flexor reflex was elicited in the right hind leg of the animal once every five seconds by single square wave pulses of 2.5 milliseconds duration at 4 to 14 volts. It was recorded kymographically. A conditioning stimulus was applied to a definite brain stem area for 15 to 25 seconds, and a record was obtained of the modification of the reflex during the administration of this stimulus.

The results were based on 51 preparations. From 348 different areas stimulated, 75 areas facilitated flexion, 39 inhibited it, 78 had no effect on this reflex, and 59 produced motor responses. Stimulation of 97 areas yielded complex modifications of flexion. From some of these areas both facilitation and inhibition could be obtained simply by changing the intensity of the conditioning stimulus. Facilitatory areas were concentrated in the dorso-medial portion, while the inhibitory areas were found in the ventrolateral portion of the brain stem. Similar distribution of facilitatory and inhibitory sites were found in the brain stem reticulum of the cat by Magoun and his collaborators. The inhibitory effects, observed during the stimulation of the medial vestibular nucleus and other structures which produced contraction of extensor muscles, were interpreted in terms of spinal reciprocal activity controlled by the brain stem.

Microfilm \$2.50; Xerox \$6.20. 128 pages.

THE ROLE OF LEARNING IN
OLFACTORY SENSITIVITY

(L. C. Card No. Mic 59-6984)

Monroe Peter Friedman, Ph.D.
The University of Tennessee, 1959

Major Professor: W. O. Jenkins

Two experiments were performed, the second being a partial replication of the first, to determine the role of learning in olfactory sensitivity. The relation between the present study and the empirical and theoretical literature of perceptual learning was discussed with particular emphasis on the current theoretical controversy in this area involving the specificity hypothesis of Gibson and Gibson and the associationist doctrine of Postman.

The two variables of distribution of practice introduced were trials per session and days between sessions. All thirty-nine male subjects were tested over eight trials by a forced-choice technique. Iso-amyl acetate was employed as the odorant.

The results showed a general practice effect over eight trials for both experiments on a magnitude and consistency basis, but only the results for the first experiment were significant. No differentiation was found for the two variables of distribution of practice. The results revealed high reliability for the measure employed in both experiments. The experimental findings were discussed in relation to the pertinent empirical literature and close agreement was found on all comparisons except the effects of distribution of practice.

The significance of the results for perceptual learning theory was discussed and no definitive conclusions were

drawn with respect to the Gibson and Gibson or Postman formulations.

Microfilm \$2.50; Xerox \$4.40. 82 pages.

A STUDY OF THE NEUROPHYSIOLOGICAL INTEGRITY OF THE AUDITORY FEEDBACK SYSTEM IN STUTTERERS

(L. C. Card No. Mic 60-433)

Hugo Harris Gregory, Jr., Ph.D.
Northwestern University, 1959

Adviser: James F. Jerger

Statement of the Problem

With the development of electro-mechanical delayed speech feedback, or delayed side-tone as it is often called, and with the observable effect that this technique has upon the fluency or forward movement of speech, there has been speculation that in stutterers there may be some breakdown in the neural auditory feedback loops at the word, syllable or phoneme level. The purpose of this study was to explore the overall hypothesis that stutterers have an inherent or acquired difference in the neural auditory feedback system and, consequently, a problem pertaining to the self-monitoring of the speech output.

The Design of the Investigation

The plan of the investigation was to utilize auditory tests which, based on experimental studies with animals and clinical evidence in man, appear to contribute to the recognition of physiological impairments at various levels of the neural auditory system. Pure tone alternate loudness balances and simultaneous binaural in-phase and out-of-phase (180 degree difference) median plane localizations were performed at intensity levels of 60 and 90 db (SPL re .0002 microbar) at 250 cps, and 30 and 90 db (SPL re .0002 microbar) at 1000 and 4000 cps. Eight speech discrimination tests were administered in which the subjects responded to tape recorded phonetically balanced word lists. The following four basic conditions were presented at the equivalent sound pressure level of 60 db (re .0002 microbar): (1) monaural unfiltered speech channeled to each ear, (2) monaural 800 cps cut-off low-pass filtered speech channeled to each ear, (3) monaural 2400 cps cut-off high-pass filtered speech channeled to each ear, and (4) simultaneous binaural presentation of low-pass (800 cps) filtered speech channeled to each ear with high-pass (2400 cps) filtered speech channeled to the opposite ear. The 30 stutterers and 10 non-stutterers were equated on the basis of age, auditory acuity, and intelligence.

Results and Conclusions

The data were analyzed statistically using a one per cent level of confidence. Analysis of the alternate binaural loudness balances did not indicate that stutterers differ from non-stutterers with reference to the integrity of the afferent neural auditory pathways in the transmission of nerve discharges from the ear to the brain. On the

simultaneous binaural in and out-of-phase median plane localization tests the intensity requirements to accomplish the criterion responses were closely comparable for the stutterers and the non-stutterers. Based on the results of the in-phase test, it was concluded that stutterers do not have a transmission problem involving the auditory pathways or a perceptual deficit similar to neurological extinction or obscuration. Furthermore, a comparison of the in-phase and out-of-phase median plane localization data did not indicate that the phase change compensated for a temporal asynchrony in the neural auditory feedback system in stutterers.

On the speech discrimination tests, the stutterers' responses were consistently poorer for each of the eight conditions and showed a significant difference on the simultaneous binaural low-pass-left-ear, high-pass-right-ear. It was concluded that in terms of the hypothesis of this study a great deal of significance could not be attached to this general trend and the significant difference on one of the speech tests. However, from a neurological frame of reference, since speech synthesis and integration are considered functions of the cerebral cortex, these findings indicate that if there is any difference in the neural auditory feedback system of stutterers, it is at this level. Consequently, suggestions were made for continuing the study of the neurophysiological integrity of the auditory feedback system in stutterers utilizing filtered speech.

Microfilm \$2.85; Xerox \$9.90. 218 pages.

AVOIDANCE CONDITIONING OF VERBAL BEHAVIOR AS RELATED TO MANIFEST ANXIETY AND THE HYSTERIA-PSYCHASTHENIA DIMENSION

(L. C. Card No. Mic 60-439)

Eleanore Marjorie Whitmore Jantz, Ph.D.
Northwestern University, 1959

Chairman: Janet A. Taylor

In the present design high and low MAS Ss (50 per group) were required to give a one-word free association to each of 15 stimulus words for ten consecutive trials. Five stimuli were designated, unknown to S, as critical stimuli, the Ss first responses to which were followed by an intense noxious auditory stimulus. Repetitions of first-trial responses to the five critical stimuli were similarly punished, the purpose being to establish conditioned avoidance of specific responses to specific stimuli. In addition, the S's degree of insight or awareness was determined in a post-experimental interview.

Two opposing sets of hypotheses were advanced. The first set of hypotheses was derived from the assumption that low MAS scores are associated with hysteria as a personality characteristic, and the latter, in turn, with greater use of repression and dissociation. On this assumption, it was predicted that low anxious (MAS) Ss, when compared to the high anxious, should exhibit (1) faster RT, (2) poorer recall of punished responses, and (3) less awareness or insight.

The second set of hypotheses made the same predictions as those outlined above, but for the opposite MAS group. These predictions were derived in part from the

assumption that high MAS Ss are more reactive to noxious stimuli than low MAS Ss, and in part from the hypotheses of the present writer that a set for speed induced by instructions in the present study would lead to fast RT, poor recall, and noninsight, and that high MAS Ss are more likely to adopt such a speed set as a result of greater anxiety elicited by the noxious stimulus.

Neither set of hypotheses was confirmed in all details, but the present results are more in line with the latter, in that insight was found to be associated with superior recall and there were twice as many low MAS Ss with insight. However, RT was slower for the noninsight Ss, a result unexpected by either set of hypotheses.

Microfilm \$2.50; Xerox \$4.40. 85 pages.

SOME CORRELATES OF CHANGE FOLLOWING SMALL GROUP DISCUSSION-DECISION

(L. C. Card No. Mic 60-755)

Reginald Lanier Jones, Ph.D.
The Ohio State University, 1959

The purpose of this study was to determine whether variables obtained from an analysis of interaction could be used to predict the change in attitude and the change in the ability to solve problems which has been noted to follow group discussion-decision.

Utilizing all students (N = 341) enrolled in the introductory course in educational psychology in the Winter Quarter of 1959, the following schedule of activity took place: Monday, the first day of class, was devoted to an orientation to the course by individual instructors (five in number). On Tuesday all groups saw the movie "How to Conduct a Discussion." An introductory case, "Charles," was presented on Wednesday. The students were randomly assigned to groups of five or six at this time. A 90-item pre-test on self-confidence (consisting of attitude, application and fact subtests) was administered on Thursday. The monograph "You and Your Students' Self-Confidence" was given to the students at the end of the pre-test and was to be used in conjunction with the discussion of three cases involving self-confidence which were presented on Friday, and Monday and Tuesday of the following week. Eighteen of the 32 groups recorded in the process of discussing the above three cases met the criteria for retention in the study. An analysis of the recordings through the use of the Conference Research Problem-Solving Category System provided predictor data. A post-test was administered on Wednesday. Differences between pre- and post-test scores on the attitude and application subtests were used as criteria. Intercorrelations between all criteria and predictors were determined and the resulting tables subjected to the Wherry-Doolittle Test Selection Method, which then selected the variables most predictive of attitude change and the variables most predictive of application change.

As a result of the analysis of data yielded by the study, it was concluded that it is possible through an analysis of interaction to determine, at a level greater than chance, the variables most predictive of attitude change and the variables most predictive of change in the ability to solve problems following group discussion-decision. The variables most predictive of attitude change following group

discussion-decision are the categories summarizing giving and solution proposals, while the categories summarizing giving and non-problem directed (with negative beta weights) were found most predictive of the change in the ability to solve problems.

Microfilm \$2.50; Xerox \$6.40. 135 pages.

RETROACTIVE INTERFERENCE IN CONNECTED VERBAL MATERIAL AS A FUNCTION OF THE DEGREE OF CONNECTEDNESS OF THE INTERPOLATED MATERIAL

(L. C. Card No. Mic 59-2796)

David Joseph King, Ph.D.
University of Maryland, 1958

Supervisor: Professor Charles N. Cofer

The present research attempted to produce significant retroactive interference in connected verbal material. The traditional retroactive interference paradigm was utilized as an experimental design. The original learning material consisted of a thirty word, third order approximation to normal English, taken from the Miller-Selfridge lists. There were five treatment groups in the study, one control group and four experimental groups. The interpolated learning material for each of the four experimental groups consisted of a series of Miller-Selfridge lists. The four orders of approximation to English prose used in the interpolated learning were zero, first, third, and fifth, each experimental group being exposed to only one order of approximation during the time of interpolated learning. Fifteen female subjects were used in each treatment group. After the interpolated learning, a recall of the original material was obtained.

Analysis of covariance of the second or delayed recall scores proved to be significant at the .05 level. The form of the percent retroactive interference distribution suggested that, with the exception of the zero order interpolated learning material group, retroactive interference increases as the interpolated learning material is made less similar to the original learning material in terms of connectedness or contextual constraint.

Finally, it was pointed out that the zero order materials from the Miller-Selfridge lists have a much lower Thorndike-Lorge frequency-of-use score than do the higher order lists. It was suggested that this difference in frequency of use may account for the failure of the zero order interpolated learning material to produce significant retroactive interference.

Microfilm \$2.50; Xerox \$3.00. 54 pages.

THE EFFECTS OF TRAINING AND MOTIVATION ON THE COMPONENTS OF A LEARNED INSTRUMENTAL RESPONSE

(L. C. Card No. Mic 60-266)

Richard Austin King, Ph.D.
Duke University, 1959

Supervisor: Gregory A. Kimble

Four groups of ten albino rats were run for 50 acquisition trials under conditions of 2, 24, 48, and 72 hours of food deprivation. Two additional groups of 20 rats were run for 20 acquisition trials under conditions of 12 hours and 60 hours of food deprivation. These groups were then divided into four groups and run for 30 extinction trials. The four groups formed during extinction were a 12-12 hour group, a 12-60 hour group, a 60-60 hour group, and a 60-12 hour group. The first number in the above group designations represents drive under acquisition conditions, while the second number represents drive under extinction conditions. This design made it possible to separate the effects of drive on learning and on performance.

The response in this experiment was running time in a 4-foot straight-alley-runway. Running times were taken for two classes of response. The first class consisted of total time taken by the S to traverse the alley (running response plus interfering responses). The second class consisted of the time of the running response only. Running times in three different segments of the alley were also obtained.

The results were as follows: (1) Learning in this situation is due largely to an increase in the strength of the running response alone and not to the dropping out of interfering responses. (2) Drive level affects both classes of response. (3) Drive, at the levels used here, and with a situation which minimizes extra-maze stimulation, affects performance but not learning. (4) The goal gradient is the result of the joint action of both response classes. The goal gradient (approach gradient) flattens as drive increases. This is a function of the elimination of interfering responses.

An attempt was made to relate each of these findings to the results of other experiments. Generally, the study of the components of an instrumental response should lead to an increase in our ability to specify the conditions necessary for a variable to be effective.

Microfilm \$2.50; Xerox \$3.60. 61 pages.

AN EXPERIMENTAL STUDY OF BENEVOLENCE AND MALEVOLENCE

(L. C. Card No. Mic 60-300)

Nina Weingarten Lambert, Ph.D.
Cornell University, 1959

This research is concerned with the perception of another person's benevolent and malevolent intentions and with the perceptual stimuli giving rise to the perceiver's own generous response.

One hundred and fifty-eight college students were shown sixteen situations. Each provided the subject with the following information about a stranger's choice between two alternative actions: 1) whether the choice benefitted or harmed the subject and whether it benefitted or harmed the stranger himself, and 2) the beneficial or harmful consequences for both parties of the rejected alternative.

A series of theoretical propositions were derived to predict the subjects' perception of the stranger's intentions. The predictions were tested with data measuring the following four variables: 1) the subject's report of the stranger's intention to harm or benefit him, 2) the subject's judgment of whether the stranger likes or dislikes him, 3) the subject's attribution of personality characteristics to this stranger, and 4) the subject's willingness to attribute the stranger's behavior to personality factors as compared with situational circumstances.

The findings confirm almost every prediction. Knowledge of the stranger's opportunities for action and the resultant gains or losses contains important cues determining whether an intention to benefit or harm is perceived. The stranger is perceived as having benevolent intent if he chooses to benefit the subject rather than harm him, especially if he himself does not also benefit from his choice. If his choice also furthers his own self-interest, it detracts from the perceived strength of his benevolence. Sacrifice of his own best interests has the opposite effect. Behavior harming both the self and the other person can be understood as sacrificing one's own best interests in order to be hostile but the subjects interpreted this behavior as stupidity. Congruent with this was the unanticipated discovery that a harmful act is less likely than a benevolent one to be attributed to personality as compared with situational factors.

In the second part of the study the subjects were asked to indicate how generous they would be to the person whose intentions, sentiments and personality characteristics they had just judged. The following three hypotheses, based on the principles of retribution, balance of lot and response to benefit, were confirmed. A subject behaves generously 1) if he infers the stranger is benevolent rather than hostile toward him, 2) if his lot is better than the lot of the stranger and 3) if he is benefitted rather than harmed, even though the stranger is not responsible for the benefit. The first two hypotheses alone accounted for 87% of the variance of the subjects' generosity scores and also their reported judgments of the other person's benevolent and malevolent intentions. Perception of competitiveness, however, is based on a different composition of factors.

Microfilm \$2.50; Xerox \$8.00. 172 pages.

BINOCULAR SUMMATION AT THE ABSOLUTE THRESHOLD OF PERIPHERAL VISION

(L. C. Card No. Mic 60-479)

Leonard Matin, Ph.D.
Columbia University, 1959

It is pointed out that the continued controversy regarding the magnitude of the difference between binocular and monocular absolute thresholds can be traced to: (1) failure

to consider the phenomenon of binocular fixation disparity; (2) failure to generally take into account the curvature of the horopter and stimulate corresponding points; (3) failure to use sufficiently precise psychophysical methodology to discriminate a result of summation from one of no summation on a consistent basis - the maximum magnitude by which the binocular threshold might be expected to be lower than the monocular threshold is .3 log units, a small difference when measured psychophysically (in this context a probability treatment is here developed of the classical Method of Limits, so frequently used in the monocular-binocular comparison - the method is shown to contain a number of variable biases).

Apparatus and methodology were developed to meet the above considerations.

Measurements were made of frequency of seeing of 2 ms., 35', fixed intensity flashes presented to corresponding locations in the two eyes. Each trial consisted of a pair of flashes, one to each eye, with a specific value of time between the flashes (ITI). Measurements were also taken of monocular frequency of seeing of the single flash to each eye on trials in which a flash was presented to only one eye.

Assuming the two eyes behave as statistically independent detectors, simple probability considerations permit a prediction for binocular frequency of seeing, $P'(B)$; this provides the null hypothesis against which to test for the presence of binocular summation. The observed values for binocular frequency of seeing, $P(B)$, are considerably above $P'(B)$ at low values of ITI, decrease to a minimum close to $P'(B)$ at about ITI values of 70 ms., rise to a second peak at ITI values about 90 ms., and then fall again to approximate $P'(B)$ at all values of ITI larger than 120 ms.

It is shown that any correlation between the measurements of monocular frequencies of seeing in the two eyes cannot be great enough to account for the difference between $P'(B)$ and $P(B)$ at ITI values smaller than 120 ms. The summation process must be in the visual system central to the optic chiasm. The form of the ITI vs. $P(B)$ function could conceivably involve a variation in correlation between locations stimulated in the two eyes produced by correlated eye movements; such a process can be shown not to be sufficient magnitude to account for the entire summation process but might act as a fluctuation superimposed on a process of nervous summation.

Microfilm \$2.50; Xerox \$7.20. 154 pages.

THE EFFECT OF ELECTROCONVULSIVE SHOCK ON MALE ALBINO RATS WITH EXPERIMENTALLY INDUCED SENSORY DEFICITS

(L. C. Card No. Mic 60-61)

David George McDonald, Ph.D.
Washington University, 1959

Chairman: John A. Stern

The hypothesis has been developed that a series of electroconvulsive shock (ECS) produces an increase in reactivity to environmental stimuli, rather than physical debilitation or cognitive deficit. To test this hypothesis, it was predicted that blind, deaf or anosmic ECS animals

would behave more like nonconvulsed normal animals, than like ECS animals. These groups were chosen for the present experiment since previous studies have shown that blind, deaf or anosmic animals are not handicapped in an enclosed alley apparatus. Experimental design was as follows: animals were given 15 ECS, one per day for 15 days, and controls received 15 pseudo-ECS; all animals were then given 20 trials in an enclosed alley straightaway, one trial per day for 20 days. The following measures were recorded: (a) time to drink when placed in goal compartment, (b) hesitation (a form of latency), (c) total time, and (d) a goal rating measure of approach-avoidance like behavior at entrance to goal box. Tests were conducted to establish that the deaf and anosmic animals were truly deaf and anosmic.

Results indicated that loss of vision was a serious handicap in learning the enclosed alley straightaway. Also, the anosmic animals were handicapped on some of the measures. The performance of operative controls (given a sham operation) was the same as non-operated controls, so that it was concluded that the anosmic animals were not affected by the operation per se. However, the deaf and anosmic ECS animals performed better on the total time measure than the ECS controls, but not as well as the pseudo-ECS controls. It was concluded that this result supported the hypothesis of increased reactivity, but was contrary to the notions of physical debilitation or cognitive deficit following a series of ECS. An attempt was made to show how increased reactivity could be employed to explain other data on the effects of ECS. It was also concluded that studies on the human level have been consistent with the hypothesis of increased reactivity: for example, patients receiving a series of convulsive shock have been found to show an increase in PGR responsiveness 30 days after last treatment. Other authors, attempting to demonstrate brain damage or cognitive deficit, have found only transitory changes which were not evident two weeks after last treatment. Several suggestions for future research were made, such as generalizing the findings of the present experiment to other situations or kinds of behavior. It was also pointed out that at the present time, there are no data indicating the nature of the physiological changes following a series of ECS.

Microfilm \$2.50; Xerox \$5.20. 102 pages.

SIMILARITY AS A DETERMINANT OF FRIENDSHIP: A MULTI-DIMENSIONAL STUDY.

(L. C. Card No. Mic 59-5204)

Anton S. Morton, Ph.D.
Princeton University, 1959

The purposes of this study were to obtain valid indices of behavioral friendships in a group, to compare these with expressions of desired friendship, to determine the stability of both kinds of friendship, and to investigate the relationship of behavioral friendship with similarity on traits relevant to group norms, interests, and extraneous associations.

A model of friendship behavior was posited. It pictures the subjects as points in space, separated by friendship distances which are inversely proportional to the extent of

their voluntary interaction. Spanning the friendship space formed by the configuration of subjects is a set of coordinate axes, sufficient in number to account for the variance in the space.

If similarity determines friendship, then subjects' projections on each dimension will correlate highly with their scores on some trait. Similarity on the given trait, then, accounts for placement in the given dimension in the friendship space.

In two college fraternities, behavioral friendship distances among 15 subjects were twice ascertained by multidimensional scaling methods. Subjects also twice expressed their friendship preferences. Subjects were scored on 17 variables considered relevant to the norms, interests, or extraneous group memberships of one or both fraternities.

Behavioral and desired friendship overlapped significantly, but not completely. Both kinds of friendship showed significant stability over a two-month interval, behavioral friendship remaining more stable than desired friendship.

The model was found to accord with the data with a high degree of accuracy. In one fraternity, the obliquely rotated dimensions of the friendship space were found to be highly associated with college class, athletic ability, and manners and appearance. In the other fraternity, the obliquely rotated dimensions were found to be highly associated with college class, professional intentions, College Entrance Examination Board Aptitude Test score, and work for the fraternity. These results were found independently in the two studies of each fraternity.

The study found that one can account for the degree of friendship among members of a group by the extent of their similarity on traits relevant to the norms, interests, and extraneous group associations of the group.

Microfilm \$4.60; Xerox \$16.20. 359 pages.

THE RELATIONSHIP OF LEVELING-SHARPENING COGNITIVE CONTROLS AND MANIFEST ANXIETY TO THE ACCURACY OF VISUAL SIZE JUDGMENTS

(L. C. Card No. Mic 60-410)

Kenneth Stanford Nickerson, Ph.D.
Duke University, 1959

Supervisor: Louis D. Cohen

Background. Various psychological investigators have pointed out the need for incorporating a class of variables termed "cognitive controls" in studies of motivation, perception, and personality. Cognitive controls are sets or dispositions which determine the pattern or style of an individual's response to problems requiring adaptation. The most widely studied cognitive control dimension has been that of Leveling-Sharpener. Leveling is the characteristic tendency to diminish or overlook stimulus differences while Sharpener is the tendency to accentuate such differences. Levelers should show poorer accuracy in visual size judgment and greater retroactive inhibition due to their difficulty in keeping stimulus traces distinct.

Anxiety has been found to impair sensory discrimination, to interfere with the shifting of sets, and to increase negative transfer. High anxiety subjects should also show

poorer accuracy in visual size judgment, and greater retroactive interference due to the intensification of competing response tendencies. Increased level of difficulty should accentuate differences between groups. The present experiment studied the cognitive controls of Leveling and Sharpener in conjunction with manifest anxiety, as these affected accuracy and retroactive interference in a visual size judgment task.

Hypotheses. 1) Sharpener and low anxiety will be associated with greater accuracy of visual size judgment; the two variables will summate so that low anxiety Sharpeners will have the highest accuracy, high anxiety Levelers will have the lowest accuracy, and groups with other combinations of anxiety and control will be intermediate in accuracy. 2) Leveling and high anxiety will be associated with greater retroactive interference in the visual size judgment task; summation of effects and similar ranking are predicted as for accuracy. 3) Increased level of difficulty will lead to an accentuation of differences between groups, in both level of accuracy and susceptibility to interference.

Procedure. Forty-eight volunteer college subjects of both sexes were selected according to the conventional categories of the Taylor Manifest Anxiety Scale. The final groups consisted of fourteen high anxiety Levelers, ten low anxiety Levelers, fourteen high anxiety Sharpeners, and ten low anxiety Sharpeners. These subjects were tested in a visual size judgment task similar to that used by Postman and Page to demonstrate retroactive inhibition in psychophysical judgment. The subjects first judged a series of thirteen comparison rectangles as wider or narrower than a standard rectangle; they then judged the same rectangles as taller or shorter than the standard; and they then made a final series of judgments of width. According to Postman and Page, the second series of judgments should lead to retroactive interference and some decline in the accuracy of judgments in the third series.

Results. 1) The hypotheses that Sharpener and low anxiety would be associated with greater accuracy of visual size judgment was confirmed, including the prediction of their summation. 2) Since accuracy scores on the first series of judgments did not differ significantly from those on the final series, and retroactive interference was not demonstrated, hypotheses concerning retroactive interference were considered not to have been adequately tested. 3) A comparison of the individual groups indicated that Leveling and Sharpener were more pronounced on easy parts of the test, while effects of manifest anxiety were significant only on the more difficult parts.

Conclusions. 1) Leveling and Sharpener are stable cognitive controls which, together with manifest anxiety, are relevant factors in the accuracy of visual size judgment. 2) These factors summate, and accurate prediction requires a knowledge of both. 3) Level of difficulty is an important variable in predicting the combined effects of Leveling-Sharpener and manifest anxiety in visual size judgment. Microfilm \$2.50; Xerox \$7.60. 163 pages.

AN EVALUATION OF THE REINFORCING PROPERTIES OF VISUAL STIMULUS CONSTRAINT

(L. C. Card No. Mic 60-785)

Vincent James Polidora, Ph.D.
The Ohio State University, 1959

Experiments were developed to test the hypothesis that visual stimuli are reinforcing to monkeys in that they provide increments of stimulus constraint. Rhesus monkeys were tested in a situation where they could present themselves with patterns which varied on a constrained-random continuum. The maximally constrained pattern consisted of a checkerboard of alternately black and white squares, and increments of randomness were introduced by manipulating the position of the white dots (which made up all the patterns) so that the patterns looked progressively less distinct toward the random end of the series. The pattern projected on the monkey's screen, the duration it stayed on the screen, and the rate at which responses were made were under the control of the monkey.

An analysis of the data revealed no systematic effects. No pattern or group of patterns was preferred over any other. Therefore, within the conditions of these experiments, the experimental hypothesis was not supported. The data do, however, give indirect support to the view that visual stimuli gain their reinforcing properties through prior associations.

Microfilm \$2.50; Xerox \$5.00. 98 pages.

ACQUISITION AND EXTINCTION UNDER EQUAL RATIOS OF VERBAL REINFORCEMENT COMBINATIONS

(L. C. Card No. Mic 60-365)

David Langdon Prouty, Ph.D.
Tulane University, 1959

Chairman: Arthur L. Irion

Three groups of 20 human Ss each were presented with a list of 12 pairs of nonsense syllables. During acquisition training Ss were required to spell both syllables of each pair. For Group RW E said Right following one member of each pair and Wrong following the remaining member of the pair. For Group RN E said Right following one member of each pair and nothing following the remaining member. The procedure was the same for Group NW with the exception that E said nothing in place of Right, and Wrong for the remaining syllable.

Extinction consisted of a series of trials on which S was asked to spell only the syllable he remembered as being correct. E said nothing following all responses for all groups during this period.

The results support the hypothesis of equal reinforcement value (though opposite in direction) for Right and Wrong. The RW group was superior in level of acquisition as compared with both the RN and the NW groups. The hypothesis of acquired differential reinforcement value for N was not clearly supported by the data. It was suggested that Ss may react differently to the absence of R as contrasted with the absence of W.

Microfilm \$2.50; Xerox \$3.00. 33 pages.

PERCEPTION AND COGNITION IN DEAF CHILDREN

(L. C. Card No. Mic 59-6942)

Joseph Rosenstein, Ph.D.
Washington University, 1959

Chairman: Dr. Ira J. Hirsh

Previous studies of conceptual behavior have noted inferior performance on the part of the deaf. These studies have not taken into consideration implicit or explicit linguistic factors in cognitive behavior or in its assessment. This study represents an attempt to evaluate cognitive ability unmediated by language. The hypothesis to be tested, therefore, was that the performance of deaf children would equal that of hearing children in tasks of cognitive functioning, when linguistic factors were minimized or eliminated.

The behaviors relevant to the conceptual process that were examined included tasks sampling the components of perceptual discrimination, multiple classification (card sorting), and concept attainment and usage (in a rational learning situation).

An apparatus was constructed that enabled the stimulus materials to be presented nonverbally and visually. The stimulus materials were so constructed as to eliminate (or minimize) the linguistic content in order that deaf subjects would not be penalized. The three tasks were presented to 60 deaf and 60 hearing children. Twenty each of the 60 deaf and hearing children represented private, public, and parochial schools. There were two age groups chosen from each of the six schools, comprising 10 eight-year-olds and 10 twelve-year-olds from each school.

Results indicate no significant difference in the performance of the deaf and hearing children that were tested; nor did type of education appear to affect performance in the dimensions examined. Some age differences were observed in the expected direction; the younger groups perseverated more often in the sorting task, and took more trials to learn in the concept attainment task. There were no significant correlations observed between intelligence test scores and any of the task scores.

The results of the analyses indicate further that the inferior performance of the deaf in tasks of conceptual functioning that has been reported in previous studies was apparently the result of the verbal and linguistic components in the task behaviors examined.

Microfilm \$2.50; Xerox \$5.00. 99 pages.

CORTICAL AND SUBCORTICAL ELECTROPHYSIOLOGICAL RESPONSES BRIDGING THE LATENT INTERVAL OF A DELAYED RESPONSE

(L. C. Card No. Mic 59-6527)

Mark Rudnick, Ph.D.
University of Utah, 1960

Chairman: Paul B. Porter

Two cats with six subcortical bipolar and two cortical monopolar electrodes and one cat with seven subcortical

and four cortical monopolar electrodes were trained by a trace conditioning procedure to such a degree that they would delay their responses (leg flexion) to the CS (three or four sharp clicks, the last of which preceded a shock US by one second).

Simultaneously with the training, the cats were habituated to tone which was later to be used as a control stimulus. General unresponsiveness of the cats was enhanced by keeping them in shallow water for 48 to 72 hours immediately preceding EEG recording sessions.

The results obtained were:

1. Following trace conditioning there was a general order of activation, but this was not invariable. This order for one cat was: (a) first the hippocampus, (b) second the septum, (c) third and fourth, in either order, the lateral dorsal nucleus of the thalamus and mesoreticulum, and (d) fifth, sixth and seventh, in any order, the nucleus centralis medialis of the thalamus, medial geniculate body, and cortex. The order of activation of the structures for the other cat was: (a) first and second, in either order, the hypothalamus and amygdala, (b) third the septum, (c) fourth the posterior medial ventral nucleus of the thalamus-central tegmental tract, and (d) fifth, sixth and seventh, in any order, the medial geniculate body, posterior medial ventral nucleus of the thalamus proper, and cortex.
2. Clicks and tone provoked the same order of activation.
3. The latency of the flexion CR was the same whether the cat was awake or asleep.
4. Flexion CRs were obtained with the cortex "asleep," but never with all subcortical structures "asleep."
5. The frequency of each structure activating with each other on the same trial and the proportion of such trials to the total trials for each structure was generally high.
6. The electrical activity of the nucleus centralis medialis of the thalamus was not affected by clicks at the beginning of the trace conditioning EEG recording session but was affected a few hours later toward the end of the session.
7. Late in the trace conditioning recording session, high amplitude, six to eight cycle per second waves occurred to clicks in all structures, but inconsistently from structure to structure and from trial to trial.
8. During periods of "dreamlike" behavior by a cat, the cortex showed arousal, but the subcortex did not.

The conclusions drawn from the obtained results are:

1. Limbic structures activate before the mesoreticulum and this early activity is not induced by the mesoreticulum.
2. The arousal process occurs in the same structures and approximately the same order regardless of the valence or quality that the arousing stimulus has for the cat.
3. There may be a constant "timing mechanism" in the brain.
4. Subcortical structures mediate a flexion CR when the cortex is "asleep."
5. The activation process is a function of the inter-relationship of structures which are not constant as measured by present instrumentation.
6. "Dreaming" involves a dissociation of the usual relationship between the cortex and subcortex.

Microfilm \$2.50; Xerox \$4.20. 80 pages.

SPEECH DISCRIMINATION IN LOW FREQUENCY NOISE

(L. C. Card No. Mic 60-452)

Howard Bernard Ruhm, Ph.D.
Northwestern University, 1959

Supervisor: Raymond Carhart

The present study was designed to investigate the question as to whether individuals with sensori-neural hearing loss suffer a disproportionate reduction in speech discrimination ability in the presence of high intensities of low frequency noise, relative to the performance of normal hearing persons under the same acoustic circumstances.

To this end, speech discrimination scores were obtained under various conditions of background noise level, speech spectrum and speech presentation level from two groups of subjects. Each group contained 20 subjects between the ages of 18 and 50 years. One group had normal hearing. The other group possessed moderate, sensori-neural hearing loss due to the effects of dihydrostreptomycin therapy or to congenital factors, these etiologies having been chosen as representative of relatively stable sensori-neural impairment. The latter group exhibited a bilaterally symmetrical hearing loss between 30 and 50 db (re audiometric zero) for the average of the frequencies 500 to 2000 cps, the audiometric configuration being either flat or gradually increasing slope toward higher frequencies.

All testing was accomplished in a two-room acoustically-treated suite. Speech testing was performed with a two-channel system, one channel of which carried the speech signal output of a tape recorder, the other of which transmitted the output of a white noise generator. The speech was capable of being presented either in broad band form or high-pass filtered at 1200 cps cut-off frequency. The noise was always low-pass filtered at a 600 cps cut-off frequency. The speech and noise were mixed electrically and were presented through a single earphone.

All speech material was recorded on magnetic tape by the investigator. Spondaic words were employed for the measurement of speech thresholds. Word lists comprising the CID Auditory Test W-22 were used for speech discrimination testing.

Speech reception thresholds were obtained under eight combinations of speech type and noise level. Specifically, speech was introduced in both broad band and filtered form against a background of low-pass filtered noise. The overall noise levels used were 0, 50, 80 and 110 db SPL. The resulting thresholds served as a base hearing level above which speech discrimination material could be presented.

Speech discrimination scores were obtained under each of sixteen conditions. These included both broad band and filtered speech presented 10 db above the spondee threshold, broad band speech presented at 120 db SPL and filtered speech presented at 116 db SPL.

The major findings and conclusions which emerged from the present study are as follows:

1. The speech discrimination of normal hearing subjects for broad band speech remained unimpaired by noise irrespective of whether speech was presented at a level 10 db above threshold or at 120 db SPL.
2. When filtered speech was used, normal hearing subjects were not adversely affected by noise until the 110

db noise intensity was reached. Here a marked reduction in speech discrimination score occurred for speech presented at the 10 db sensation level. A lesser effect in the same direction was observed for the 116 db SPL filtered speech level.

3. The speech discrimination of sensori-neural subjects remained essentially unchanged as noise level was varied until the 110 db level was reached, where a decided reduction in discrimination was exhibited. This change was invariable, regardless of whether speech was presented at the 10 db sensation level or at either of the high sound pressure levels. Similarly, the effect was consistent regardless of whether speech was presented in either broad band or in filtered form.

It is concluded that persons with sensori-neural impairment, as here exemplified by subjects with losses due to dihydrostreptomycin or to congenital anomalies, exhibit a disproportionate reduction in speech discrimination capacity under conditions of high level, low frequency noise. This conclusion has practical implications for communication in many industrial environments. It also has pertinence to the selection and use of hearing aids by individuals with sensori-neural hearing loss.

Microfilm \$2.95; Xerox \$10.35. 228 pages.

AN INVESTIGATION OF SECONDARY MOTIVATION AND CONDITIONED SATIATION BASED ON THE HUNGER DRIVE

(L. C. Card No. Mic 60-698)

Melvin Anthony Schmitz, Ph.D.
University of Kentucky, 1954

Supervisor: Dr. James S. Calvin

The association of neutral stimuli with the reduction or reinforcement phase and the motivation phase of the drive cycle has been investigated in the past. Neutral stimuli associated with the reinforcement phase have been called secondary reinforcers, and those associated with the motivation phase have been referred to as secondary motivators. The association of neutral stimuli with the satiation phase, or conditioned satiation, has not been investigated.

The concept of secondary reinforcement is generally accepted in the field of learning theory. Secondary motivation has not been investigated as thoroughly, and the question of association of neutral stimuli with the hunger drive has not been settled. The experiments in secondary motivation were reviewed and the concept of secondary satiation discussed.

In this study an attempt was made to find evidence for conditioned satiation and secondary motivation, based on the hunger drive, by training animals in striped boxes at different drive levels from satiation to twenty-three hour food deprivation. It was hypothesized that the animals would associate the neutral striped box stimulus with a particular drive level or absence of drive level.

A satiated group, a control group, a three hour group, an eleven hour group, and a twenty-four hour group was utilized. If the hypotheses were accepted, adjusted means should show a gradation in eating in the order presented

above, with the satiated animals eating least and the twenty-four hour animals the greatest amount of food. Food consumption was measured at five, fifteen and thirty minutes during training and test trials. There were no significant differences between means for the last four days of training and the four test days for any of the groups, with the exception of the three hour group at the thirty minute weighing. This could be attributed to chance. Similarly, there were no significant differences between the five groups when analyzed by the covariance technique.

The conclusion was that secondary motivation and conditioned satiation were not established in this study.

The experimental and theoretical work concerning this topic was reviewed and recommendations for further study were outlined. Microfilm \$2.50; Xerox \$3.00. 47 pages.

A STUDY OF SOME RELATIONSHIPS BETWEEN PERSONALITY TRAITS AND LEARNING ABILITY

(L. C. Card No. Mic 60-701)

Stanley Cube Skiff, Ph.D.
University of Kentucky, 1950

The problem of this investigation is to examine the relationship between proficiency in learning and certain personality characteristics. It is the thesis of this paper that the individual variables have not been sufficiently considered in the effort to predict learning ability. Individual variables which refer to the variation in the characteristics of different individuals may be contrasted with situational variables which refer to variation in the different situations any individual encounters. Personality tests have been used in this study to measure the individual variables.

Four experiments were carried out. In Experiment I, fifteen submissive and fifteen ascendant persons (equated for intelligence) learned fifteen equated lists of nonsense syllables. Experiment II differed from Experiment I in mental set: the subjects were told that the ability to learn nonsense syllables is highly related to intelligence. In Experiment III, individual Rorschach tests were given to twenty subjects used in Experiment I. Subjects were equated in intelligence again and their perception, whether "whole" or "detailed" noted. Experiment IV consisted of giving a group Rorschach to all subjects used in Experiment II. Once again intelligence was equated.

It is the contention of this paper that the habitual way of acting is the person's personality. A submissive subject can learn a task in which he is required to submit to rigid experimental conditions (as is usually the case in nonsense syllable learning) better than an ascendant subject can simply because the task is easiest learned with the attitudes and habits already possessed by the submissive person. This contention is supported by the results of Experiment I. When the ascendant person is motivated to submit to these conditions by presenting a challenge to his intelligence learning improves. If the instructions are such as to change the mental set of the submissive person and hence to a degree make him assume the habits of the ascendant person he can learn with less advantage over the ascendant subject than when left to his own habits and methods.

Experiment I points to the fact that, left to their own devices in learning a submissive task, submissive persons can learn with less trials than ascendant persons. Experiment II points to the fact that strong motivation lessens the difference in groups.

Taken altogether the results of Experiment III and Experiment IV suggest better learning of a detailed task by persons possessing a "whole" manner of perceiving.

Some predictions about learning ability for certain tasks can be made by knowing personality traits. A submissive person can learn a detailed task requiring long concentrated effort in less trials than can an ascendant person of the same intelligence. Part of this advantage disappears under strong motivation. The last two experiments reported suggest that a person who habitually perceives wholes on the Rorschach test can learn a detailed task in less trials than can a person who habitually perceives details on the Rorschach test.

It is proposed that personality develops by learning. The idea suggested in this paper is that once one has learned to react in an ascendant or submissive manner he attacks problems generally this way. Those problems that cannot be handled in this manner are bound to cause the learner trouble. Whenever some response results in a reduction of motivation the chances are that the response will occur again under the same stimulating conditions. The way the organism comes to satisfy its needs can be described as its personality. Learned patterns of behavior become stable in accordance with the degree that they reduce anxiety. This is reinforced behavior.

Some activities are reinforcing to an ascendant person and not to a submissive one. Thus the ascendant person, receiving reinforcement from an act, can learn it easier. The need for ascendancy or submission may be thought of as a second order drive, which, after being learned itself, can now play a role in future learning.

Microfilm \$2.50; Xerox \$6.60. 139 pages.

LEARNING PARAMETERS, APTITUDES, AND ACHIEVEMENTS.

(L. C. Card No. Mic 59-5228)

Robert Earl Stake, Ph.D.
Princeton University, 1958

The research project was an investigation of the individual differences in certain learning performances with particular reference to measures of various mental abilities and achievements. According to the literature on human learning it had not been ascertained whether a general learning ability factor could be identified in all learning performances, whether there are multiple learning abilities that are specific to each task or type of task, or even whether learning ability could be defined by the results of tests given once only.

To investigate these relationships a dozen learning tasks were devised. These tasks varied as to their verbal or nonverbal content, as to whether rote or relational learning was required, and as to the incentive that was provided. They were selected to parallel some common scholastic learning experiences. A reference battery of intelligence, achievement and factorial aptitude tests was assembled.

Learning task scores, reference measurements, and course marks were obtained from 240 children. The data for each learning performance were fitted by a theoretical curve, (a modification of a rational hyperbola derived by Thurstone). Three parameters, an asymptotic or total errors parameter, a curvature or learning ability parameter, and a goodness of fit or regularity of performance parameter, were obtained for each performance. These parameters, the reference measurements, and the course marks were intercorrelated. Correlations of the goodness of fit parameters with aptitude and achievement and even the intercorrelations of fit parameters on different tasks were found generally to be negligible. It was found that the curvature and asymptote parameters were substantially correlated, +.1 to +.6, with scholastic aptitude and achievement as measured by conventional standardized tests. Thus, unlike the majority of previous studies, there is support here for defining intelligence as the ability to learn. Correlation of the curvature and asymptote parameters with course marks ranged from 0 to +.5. Intercorrelations of curvature and asymptote parameters for the same task were very high. This means that those learners who start well finish well. There could have been only a few subjects, if there were any, who "start slowly and finish fast" on this kind of task.

The matrix of correlations was factor analyzed. The final rotated factor matrix yielded one racial factor, two achievement factors, six reference factors, four learning factors and one uninterpreted factor. Two of the learning factors were interpreted as memory-task learning factors. These factors were independent of the rote memory factor obtained from reference tests. Another learning factor was found to be associated with tasks which required considerable use of numbers, so it was interpreted as a numerical-task learning factor. The fourth learning factor was defined primarily by the goodness of fit parameter for four tasks. These four tasks, by being boring or distracting, seemed to require a special effort on the part of the learner to perform regularly and successfully. This factor has been interpreted as a concentration factor.

The findings of this study revealed no general learning ability other than the general aptitude that is measured by such tests as an intelligence test given just once. Added incentive, one of the design variables, had universal rather than individual effect: the same learners excelled regardless of the incentive provided. The association of one of the learning factors with a group of numerical task supports the hypothesis that learning ability can be specific to a type of task. No factors were found to support the hypothesis that a rote learning performance is fundamentally different from a relational learning performance.

Microfilm \$2.50; Xerox \$4.60. 90 pages.

AGE AND SEX AS FACTORS IN ABILITY OF ADULTS TO DISCRIMINATE SATURATION DIFFERENCES IN THE COLORS CYAN AND YELLOW

(L. C. Card No. Mic 59-6253)

Irving Streimer, Ph.D.
New York University, 1959

This study investigated the influence of age and sex and their interaction upon the ability of adults to discriminate small saturation differences in the colors Cyan and Yellow.

One hundred twenty subjects, carefully screened with regard to their academic and experiential backgrounds to minimize the influence of these factors on the test, were subdivided into four age groups: twenty through twenty-four, twenty-five through twenty-nine, forty through forty-four, and forty-five through forty-nine years of age inclusive. Each of the age groups was further subdivided into two sub-groups, each sub-group containing fifteen members of one sex.

The entire test population was subjected to the same test procedures and test. The test was essentially a multiple choice matching task involving the discrimination of small saturation differences in colors of specific wave length.

The stimuli were a series of monochromatic lights differing from each other only in saturation. These lights were obtained by passing light from a standardized source through film transparencies capable of transmitting light of a specific wave length only. Brightness was controlled by the use of a new type of neutral density filter which yields equal opportunity of transmission for all energy in the visible region of the spectrum.

The stimuli were mounted on six cards, each card containing a standard and seven possible matches. Three saturation ranges were used (low, normal and high), with each card containing the stimuli in one range for one color. All stimuli were viewed with Daylight Light as the adapting light.

Each subject made three choices on each stimulus card, eighteen choices in all. The stimulus cards were rotated physically after each presentation to eliminate the influence of positional preference on selection. The cards were presented in a predetermined order, resulting in the appearance of any given card for the second trial only after five other cards had been presented.

The data were analyzed by the Analysis of Variance technique and, where indicated by the *t* Test. The results of the study are as follows:

1. No significant results were found for the variable of Sex on any of the test cards.
2. No significant results were found for the interaction of Sex and Age on any of the test cards.
3. Significance, at the 5% level of confidence was found for the variable of Age in the low saturation range of the color Cyan.
4. No significant results were found for the variable of Age for any other color or saturation range.

The results were inconclusive and indicated the need for further research in this area.

Microfilm \$2.50; Xerox \$5.20. 101 pages.

THE MEANINGFULNESS OF THREE HUNDRED AND TWENTY WORDS AND PARALOGS

(L. C. Card No. Mic 60-474)

John David Taylor, Ph.D.
Duke University, 1959

Supervisor: Gregory A. Kimble

The purpose of this study was to provide an adequate scale of meaningfulness, as this variable is defined in the area of verbal learning. Previous scaling attempts were found to be inadequate because (1) only nonsense materials were scaled, or (2) the list of verbal items was too small and perceptually heterogeneous, and (3) a tendency toward response chaining and the arbitrary deletion of classes of responses produced a peculiar indeterminacy in the assignment of scale values. Accordingly, a set of 320 nouns and paralog, each five letters long, beginning with a consonant and alternating consonants and vowels was selected such that specific letter combinations were made quasi-random and most of the meaningfulness dimension would be tapped. These verbal items were presented, one at a time to each of 100 Ss in an associative RT situation by a procedure which randomized order and sequence effects. The resulting distributions of mean RTs and percentage of Ss responding within 2.5 sec. were reasonably rectangular through much of their ranges, with substantial variances.

Analyses of relationships among response measures indicate that the results of this experiment can be adequately interpreted in terms of the Hull-Spence conception of the habit-family hierarchy, provided one assumes that the mean net excitatory potentials of the members of large habit-family hierarchies tend to be small. A correlation of +.629 was found between frequency of response in the dominant response category (F) and percentage of Ss responding within 2.5 sec. (P). Over and above logical restrictions involved, there was a correlation of -.546 between P and number of competing responses (C). Analyses of co-variance which attempted to equate F-values were performed for part of the data on mean RTs for the dominant response and for the alternative responses with levels of C as an independent variable. These analyses showed that mean reaction time for the dominant response was uninfluenced by the number of response alternatives. Reaction time for the nondominant responses, however, were slower when the number of such responses was large than when it was small. This finding was interpreted as supporting a hypothesis derived from the Hullian treatment of competing reaction potentials.

Microfilm \$2.50; Xerox \$3.00. 59 pages.

PUNISHMENT: THE EFFECTS OF VARYING ITS POINT OF APPLICATION.

(L. C. Card No. Mic 60-618)

Thomas Joseph Tighe, Ph.D.
Cornell University, 1959

The aim of this research is threefold: (1) to determine if the administration of punishment during different portions of a serial response will produce different effects

upon the strength of the response; (2) to provide information concerning the relevance of this variable as a factor in the failure of extinction of punished escape and avoidance responses as reported by several investigators; (3) to provide a basis for comparing the relative effects of punishment and frustration. Subordinately, habituation to shock is also investigated.

The following procedure was employed. Following similar acquisition of a running response in a segmented runway, albino rats were divided into groups of ten subjects for differential treatment. One group was given a brief electric shock at the beginning of the maze, a second group was shocked in the middle, and a third at the goal end of the maze. Each subject received four shock trials per day for twelve days. During this period the shock was increased on successive days from an initial value of 0.1 milliamp to a final value of 2.0 milliamps and the subjects continued to receive food reward for running to the goal. Some control subjects underwent normal extinction and other control animals continued to receive food reinforcement without punishment. The apparatus and procedure employed were otherwise identical to that used in a previous study investigating the effects of frustration administered at different portions of the response sequence.

The following conclusions were drawn from the results of this treatment. (1) The data indicate a differential effect of the point at which punishment was applied. By three measures -- the number of animals in each group reaching criteria of response suppression, the number of trials to these criteria, and the mean log latency under punishment -- greater depression in response strength was found for those subjects punished in the middle stages of the response sequence as opposed to the beginning and end. It is hypothesized that the curvilinear effect of punishment observed in this study is due to a curvilinear gradient of approach. Verification of this hypothesis requires an adequate independent measure of approach strength at the beginning of such an instrumental response. (2) It is concluded that the point of punishment is not the variable accounting for opposing results which have been obtained by investigators on the resistance to extinction of punished escape and avoidance responses. (3) Punishment applied to the middle and end of the response sequence was found to produce effects similar to those obtained by administering frustration at the middle and end. The lack of adequate data on the effects of frustration administered at the beginning of a response sequence precludes a comparison at this point. (4) A subsequent procedure which explored the effects of gradual increase in the intensity and frequency of punishment was found to alter greatly the role of the punishing stimulus. In some cases this treatment produced response facilitation (defined as a reduction of latency below that of control subjects) or the development of clearly maladaptive behavior.

Microfilm \$2.50; Xerox \$4.80. 95 pages.

MASKING BY NARROW BANDS OF NOISE IN NORMAL AND IMPAIRED EARS

(L. C. Card No. Mic 60-458)

Tom Whitten Tillman, Ph.D.
Northwestern University, 1959

Adviser: Dr. James F. Jerger

The literature on the masking of pure tones by thermal noise in impaired ears is characterized by controversy. Some authorities contend that the masking produced for pure tones by thermal noise in impaired ears is sufficiently different from that produced in normal ears to justify the use of noise audiometry as a tool in the differential diagnosis of hearing disorders. Others are equally confident that the masking produced for pure-tone signals in impaired ears by wide-band thermal noise is in no way different from that observed in normal ears for equivalent relative noise levels.

Recently it has been suggested that the spread of masking to the frequency regions above and below a narrow band of noise might represent a more fruitful avenue for demonstrating differences in the masking behavior of normal and impaired ears.

Consequently, this experiment was designed to test the hypothesis that narrow-band thermal-noise signals adjusted to equivalent effective levels would: (1) produce equal masking in the normal and the impaired ear at frequencies within the given noise band; (2) produce an excessive "spread of masking" to frequencies both above and below the given noise band in the impaired ear.

To test this hypothesis, three groups of subjects were formed. The first two groups were each composed of 10 normal-hearing subjects. In one of these groups, both ears of each subject were plugged with wax-impregnated cotton to create mild conductive-type hearing impairments characterized by relatively flat audiometric configurations. The third group contained 20 subjects with sensori-neural hearing losses presumably due to cochlear pathology. The subjects in this latter group were selected so that the degrees of their hearing impairments as well as the shape of their audiometric configurations duplicated as closely as possible those of the plugged-normal subjects.

The masking produced for each of these 40 subjects by three octave-band thermal-noise signals adjusted to effective levels of 10 and 30 db was measured at 11 test frequencies from 125 through 8000 cps. The three noise bands were defined by the following nominal cut-off frequencies: (1) 400-800 cps; (2) 1200-2400 cps; (3) 3200-6400 cps. All thresholds, both in quiet and noise, were recorded using the psychophysical method of adjustment.

Results indicated that the three noise signals at the 10-db effective level produced approximately equal masking for all three groups at all test frequencies. In general, for any given band set to an effective level of 30 db, approximately equal masking was observed for all three groups at frequencies within a given noise band. However, for the sensori-neural group, an excessive spread of masking to frequencies both above and below any particular noise band was observed. This spread of masking was most excessive in the frequency range above the noise bands. Below any given band, the excessive masking was characterized by equal masking over frequency.

Comparison of the data collected here for the sensori-neural group with that reported by earlier workers for

normal ears indicated that a narrow-band noise signal at an overall intensity level of approximately 100 db SPL re: 0.0002 microbar shifts the threshold of the normal ear and the sensori-neural impaired ear to approximately the same intensity level at frequencies within the noise band. However, the masked threshold SPLs for the sensori-neural impaired ear exceeded those of the normal ear at frequencies both above and below the noise band.

These observations support the findings of earlier workers and confirm the hypothesis, stated earlier, which this experiment purported to test.

Microfilm \$2.50; Xerox \$7.80. 168 pages.

A STUDY OF 'AUTONOMIC REACTIVITY' IN MICE AS RELATED TO DEVELOPMENTAL ENVIRONMENT, APPROACH RESPONSE IMPEDANCE, AVOIDANCE CONDITIONING RATE AND DIFFICULT DISCRIMINATION TRAINING.

(L. C. Card No. Mic 60-528)

Ethel Tobach, Ph.D.
New York University, 1957

Adviser: T. C. Schneirla

The phenomenon of defecatory reaction in B/Albino C mice (called 'emotionality' and 'autonomic reactivity' by previous investigators) was studied with respect to its validity, meaningfulness in differentiating individuals, and developmental aspect with emphasis on the role of early environment.

The social and physical aspects of the environment during the litter period were varied daily. The social environment was varied by exchanging the dams and litters with which the experimental animals were raised. The physical environment was varied by changing the shape and size of the cage, and the kind of nesting material. One group was raised in constant social and physical environments. A second group was raised in a varying physical and a constant social environment. A third group was raised in a constant physical environment but in a varying social environment. A fourth group was raised in varying social and physical environments. These litters were observed daily from day of birth till weaning in a modified open-area situation (Hall). A fifth group was raised in constant physical and social environments and handled once every five days only.

The day after weaning half the animals in the first and fifth groups and all the animals in the other groups were observed in a new open-area situation. For ten days these animals were deprived of water 20 hours daily but allowed to drink in the open-area situation. On the 11th and 12th days an empty water bottle was presented (behavioral impedance). The next day the first and fifth groups were conditioned to make an avoidance response to electric shock upon presentation of an arc of light. Upon conditioning, training for discrimination was begun.

No correlation was found between the age of onset of defecation and the defecatory reaction in the open-area, the behavioral impedance and the conditioning or discrimination situations. The defecatory reaction seems to be situationally determined rather than being characteristic of the animal.

Positive correlations were found between rate of avoidance conditioning and the defecatory reaction to the open-area situation, the discrimination training, and the conditioning situation. A negative correlation was found between defecatory reaction in the conditioning procedure and conditioning rate.

Animals raised in a constant physical environment showed lower rates of defecation during the first observation in the open-area situation than animals raised in a varying physical environment. Animals raised in a varying social environment defecated less in the behavioral impedance situation than animals raised in a constant social environment. Animals raised in a constant physical and social environment and handled once every five days defecated less than the animals handled daily and raised in a constant social environment.

On each day during the litter period twelve to twenty animals from the regular stock were observed in the open-area situation (days 1 through 21). These control animals, handled only once on the day of observation, decreased in defecation on days 13 and 14 of age. There was no such decrease in animals handled every day. On day 12, both animals handled only once and animals which had been removed from the litter for two hours daily to determine the age of onset of spontaneous defecation, defecated significantly more than did other animals. Animals which were away from their litters for two hours daily urinated spontaneously earlier than the other animals, and their eyes opened later than those of all other groups.

The change in the direction of the differences in defecatory reaction of the groups at different stages of development emphasizes the dynamic interaction of internal and external factors in ontogenesis (Schneirla) and stresses the need for experimental investigation of the interrelationship of these factors at all stages of ontogenetic development. Microfilm \$2.50; Xerox \$7.00. 146 pages.

AN EXPLORATORY STUDY OF CHROMATIC DISCRIMINATION WITH A BINOCULAR METHOD

(L. C. Card No. Mic 60-804)

Hensel Owen Ward, Ph.D.
The Ohio State University, 1959

Thresholds for chromatic discrimination were measured with a binocular arrangement from selected spectral stimuli ranging from 436 mμ to 680 mμ, using equal luminance stimuli. Measures were also obtained on discrimination from stimuli located on a line connecting 436-680 mμ, and 478-680 mμ. These and additional data were plotted on the color diagram in the form of ellipses, and color mixture specifications were also derived from the results.

Stimuli lying on the line connecting 436 and 680 mμ are located by terminal regions of invariance which are elliptical in shape and are orientated toward the opposite end of the diagram. Lines falling midway between the limits of these terminal ellipses are essentially linear and represent iso-chromatic lines.

The just noticeable differences determined along the 436-680 mμ side of the diagram increase to a maximum located in the middle region of the equal-interval stimulus scale and decrease as the other primary is approached. Equal combinations of these binary components presented

to the two eyes are seen as equal up to a point where there is about 80 per cent of the 436 m μ component in the mixture. The curve then tails off to where 436 m μ is matched by a mixture that requires 10 per cent of the 680 m μ component.

The color thresholds for spectral stimuli lying on the short wavelength side of the spectrum have been measured on a line connecting the 436-530 m μ . These limits increase slowly at first in moving from the 530 m μ primary in the direction of 436 m μ . An extremely rapid increase in the size of these limits begins at about 500 m μ and continues to about 470 m μ , where a terminal threshold is reached. Stimuli below this region cannot be discriminated in this direction, and are located on iso-chromatic lines analogous to those described in paragraph 1 above.

Discrimination limens for admixtures of 680 m μ to short wave length stimuli locate the spectral stimuli, and give limits that are positioned equi-distant on either side of the 436-540 m μ line.

Threshold limits on the long wavelength side of the color diagram are only a small fraction of the size of those for the short wavelengths just described. As in the case of stimuli located on the 680-436 m μ line, just noticeable differences are found to reach a maximum in the middle region of the scale and decrease in both directions toward the primaries.

Long wavelength (680-530 m μ) stimuli lie inside the color diagram by a small distance, so that 520 m μ presented to one eye is matched by 530 m μ in the other eye and stimuli of longer wavelengths all require a tristimulus match. This effect is reflected in an inward shift of the entire locus of the spectrum on this side of the diagram that is analogous to that mentioned in the preceding paragraph for the shorter wavelengths.

This shift of the entire spectrum appears to be characteristic of the binocular method and is related to a differential interocular brightness difference found in the present studies. These shifts are explained in terms of adaptation effects, within the context of a frequency theory. Certain additional implications for color theory are discussed.

Comparisons are made with the findings of previous investigators, and specific attention is given to the direction and location of the JND limits in the different regions of the color diagram. A major difference is noted in the present findings in that limens measured along lines for 436-680 m μ and 530-680 m μ reach a maximum size in the middle region of the scale. A possible explanation for these differences is discussed.

Attempts are made to develop some of the theoretical implications of the results reported in the present paper. This includes reference to some of the more recent findings from neurophysiology that deal with mechanisms located at various levels of the nervous system.

Microfilm \$2.50; Xerox \$5.80. 116 pages.

THE RELATION BETWEEN BORDER GRADIENTS AND CONTRAST THRESHOLD

(L. C. Card No. Mic 60-806)

Bradford Williston Wild, Ph.D.
The Ohio State University, 1959

A series of experiments was devised to study the results of blurring a border by means of a linear gradient of illumination and to attempt to establish the physiological basis for these findings. In the first experiment the method employed was the determination of the threshold of detection by means of a constant stimulus procedure. It was found that the threshold decreased with increased luminance until at the highest amount of luminance an upturn in the threshold was found for the two most blurred distributions.

In the next part of the experiment the luminance difference threshold for a test object superimposed on a gradient was obtained by means of the method of limits. The use of a gradient field enabled the experimenter to isolate three separate border effects that hitherto had not been reported in the literature. It was found that for different degrees of blur, regions of decreased sensitivity became noticeable. These insensitive regions are unrelated to either the physical light distribution or to their perceptual appearance. The largest decrease is found at the dark edge of the gradient, but other regions of decreased sensitivity occur at the bright border and, provided that the gradient is long enough, at a distance of fifty minutes of visual angle from the bright border on the gradient side. It was established that the borders were the causal factors of these regions of decreased sensitivity by means of using luminance distribution gradients that produced sharp borders and no definite borders. It was also determined that the shape of the distribution produced no effect upon a border placed at the center of the gradient. However, as the border gets sharper and sharper, the decrease in sensitivity becomes more pronounced. This high threshold is accompanied by increased variability of observer response, which is the probable reason that some ambiguity can be found in the literature on this topic. The variability is not sufficient to conceal the sometimes enormous increase in threshold that occurs at this point.

On the basis of the data it has been possible to eliminate the theory of veiling luminance as the major cause of these phenomena. In its place a theory of interaction has been proposed that more nearly satisfies the experimental findings. The contribution of stray light is not to be overlooked even though a new theory has been advanced, since stray light is assuredly a contributing factor. The site of this interaction is believed to be in the region of the ganglion cells in the vicinity of the parafovea, at the junction of the rod-free zone with the rod-cone zone. Additional inhibition is thought to occur between adjacent retinal elements, with the more active elements inhibiting the action of the less active ones. The site of this inhibition could not be determined in this experiment, nor could the mechanism be identified. Because of the lack of anatomical evidence of interconnections between foveal elements, it seems logical to attribute the interaction to a modified version of the field theory of Kohler and Wallach.

Microfilm \$2.50; Xerox \$3.60. 62 pages.

A CLASSICAL CONDITIONING TEST OF STIMULUS PREDIFFERENTIATION

(L. C. Card No. Mic 59-3028)

Matthew Yarczower, Ph.D.
University of Maryland, 1958

Supervisor: Dr. Thomas G. Andrews

This study was an attempt to determine whether stimulus predifferentiation training facilitates subsequent discrimination among the same nonsense stimulus shapes. Theoretical analyses of two major viewpoints on the effects of prior discriminations suggested that generalization among the stimuli is reduced by paired-associate training, even though the response members are not relevant or related to the response in the discrimination task.

It was hypothesized that recognition of the stimuli would be facilitated by the pretraining when recognition is measured by the amplitude of a conditioned galvanic skin response.

Four groups of 10 undergraduate students in each received paired-associate training on 5 nonsense shape-word associations. The two experimental groups used shapes that were later used in the test task. The two control groups received similar training on irrelevant shapes. An adjusted

learning method was used to bring the groups to one of two criteria. One experimental group and its control group had to correctly anticipate each associate once. The two remaining groups had to anticipate each associate correctly three consecutive times. After reaching the criterion level all groups underwent classical conditioning of a galvanic skin response. Ten paired presentations of stimulus shape and shock were administered to all subjects. Immediately following the 10 conditioning trials, differential conditioning was undertaken, presenting the positive stimulus 5 times in a series of 25 trials, measuring the amplitude of the GSR for both negative and positive stimuli. After a 15 minute rest 25 more trials were given, after which all subjects were interviewed.

The results indicated that paired-associate learning, if carried out to a sufficiently high level, facilitates subsequent differentiation and discrimination among the stimuli. Whereas previous research has generally yielded negative results with respect to the facilitation of recognition or perceptual discrimination by the predifferentiation training, the present study indicated that such training affects subsequent recognition of the same stimuli, when recognition is measured by a conditioned GSR. The role of reduced internal generalization and the acquired distinctiveness of cues were discussed.

Microfilm \$2.50; Xerox \$3.60. 64 pages.

RELIGION

DOMINANT THEOLOGICAL CURRENTS IN JAPANESE PROTESTANT CHRISTIANITY FROM 1920 TO 1958 WITH PARTICULAR REFERENCE TO THE NATURE OF THEIR UNDERSTANDING OF THE RESPONSIBILITY OF CHRISTIANITY TO SOCIETY

(L. C. Card No. Mic 60-11)

Charles Hugh Germany, Ph.D.
Columbia University, 1959

This work comprises a description of the major theological influences in Japanese Protestant Christianity from the year 1920 to 1958. The central section of the dissertation deals with the confrontation of liberal and dialectical theology within the Christian scene in Japan.

An introductory chapter on the backgrounds of liberal theology, and to some extent non-liberal theology, in the Meiji and early Taishō periods is followed by chapters on modern Japanese liberalism and on the liberal social Christian episode within the Japan Student Christian Movement. By way of the theology of biblical evangelicalism of Takakura Tokutarō, the entrance and spread of European dialectical theology is described. A brief chapter deals with wartime theological currents in Japanese Christianity.

The final chapter of the dissertation discusses the impact upon Japanese Protestant Christianity, particularly as seen in the United Church of Christ in Japan (Nihon Kirisuto Kyōdan), by the new elements and energies in post-war Japanese society and by the growing theological interest in Reinhold Niebuhr, Emil Brunner, Paul Tillich,

Rudolf Bultmann, and in the modified position of Karl Barth. The final chapter presents evidences of developing social and cultural awareness in the theological thought of the United Church of Christ and suggests emergent theological unity in this church around the theme "theology of mission."

The dissertation maintains a reference in the discussion of the theological influences to the nature of the relation of the theologies to the question of the responsibility of the church to Japanese society. This social reference, however, is not meant to be construed as a touchstone for a value-judgment of the theologies.

The study does not undertake, beyond occasional references, to give detailed treatment of the separate denominational positions in Japanese Christianity. The final chapter, as indicated, does contain a fuller consideration of church policy and currents of thought in the United Church of Christ.

Sources used in analyzing the theological currents are for the most part Japanese writings. References are made to recorded interviews and conferences with Japanese theologians and committees in areas where written materials are not yet adequate.

Microfilm \$4.45; Xerox \$15.75. 346 pages.

A HISTORY OF THE PRIMITIVE BAPTISTS

(L. C. Card No. Mic 59-6711)

Julietta Haynes, Ph.D.
The University of Texas, 1959

Supervisor: Walter P. Webb

The primitive Baptists are a small religious body living for the most part in the traditions and practices of the Baptists of the late eighteenth century before the introduction of modern religious practices. When Arminian doctrine and foreign missions were introduced among the Baptists in the early nineteenth century, Primitive Baptists refused to accept them preferring to retain predestinarian doctrine and simple church service.

They agree with other Protestant denominations on the inspiration of the scriptures, the trinity and the resurrection, but their most distinguishing characteristic is their Calvinist doctrine--total depravity, unconditional election, limited atonement or particular redemption, effectual calling and the final preservation of the saints--which they have refused to water down as have other Calvinist denominations. This plan of salvation leaves no room for contingency and conditionalism. Salvation is God's work and man has nothing whatsoever to do with it.

Primitive Baptists are primarily a rural people and they are found chiefly in the South and Southwest. They are also a law abiding people. Strong discipline is maintained over church members. Persons guilty of dishonest or immoral practices are excluded and must reform outside the church.

While Primitive Baptists are agreed on the major principles of doctrine and practice, there have always been enough minor differences among them to cause trouble and division so that there are now three major factions--Old Liners, Absolute Predestinarians and Progressives. Old Liners comprise well over half of the denomination and are the middle of the road group. Absolute Predestinarians differ with the Old Liners and Progressives over predestination believing that God's positive or efficient decrees cover all things but that He is not the author of sin. The other groups hold that though God suffers or permits evil, His positive predestination extends only to the elect. The Progressives have modernized their church organization and services by placing musical instruments, choirs, Sunday schools, women's organizations, etc., in their churches until they have most of the organizations and activities found in the popular denominations.

The majority of the denomination (Old Liners and Absolute Predestinarians), however, have none of the appendages of the modern church. Their organization and services are simple and uncomplicated. Worship consists of singing, praying and preaching. Ministers speak extemporaneously and are not seminary educated. Government is congregational having only ministers, deacons and clerks. There are no organizations within the church and none outside except the district association which meets annually for worship, fellowship and advice. It has no authority over the churches. Primitive Baptists have refused to accept the concept of the church as an evolutionary institution, expanding its offices and services to meet the needs of all times. Rather, they believe that the apostolic church presided over by Christ and the apostles contained everything needed to meet the needs of all times;

hence, they have none of the unscriptural organizations which encumber most modern churches.

Finally, the fact should be mentioned that though the Primitive Baptists are a declining people, except for the Progressives, they are not in any danger of dying out in the near future. They find great comfort in the doctrine of election believing that it is the only doctrine that will carry the Christian safely through the troubles of this world into the glories of the next. They have great love for the church and each other. This love will enable them to survive. Microfilm \$5.25; Xerox \$18.40. 410 pages.

CHIH-I, (538-597): AN INTRODUCTION TO THE LIFE AND IDEAS OF A CHINESE BUDDHIST MONK.

(L. C. Card No. Mic 60-33)

Leon Nahum Hurvitz, Ph.D.
Columbia University, 1959

Chih-i was born near Chiang-ling in Hunan Province. Having lost his parents in civil war, he took monastic orders under the sponsorship of a military officer in 555. After furthering his education under various masters, he went to Mount Ta-su in Honan Province, where he became the pupil of Hui-ssu in 560. His discipleship to Hui-ssu was terminated in 567 by the latter's decision to move to Nan-yüeh, a mountain in the same province. Chih-i took his followers to the Capital at Chin-ling (near the present Nanking). During his eight years of residence in the Capital Chih-i became more and more attached to Buddhist contemplation. Therefore he decided to take up residence on T'ien-t'ai, a mountain in Chekiang Province and a place already famed in Chinese tradition as a Buddhist and Taoist retreat.

Insistent requests from the Imperial family forced Chih-i to return to Chin-ling in 585, where he remained until the Sui conquest of South China in 589. Then he went to Lu-shan, a mountain in Kiangsi Province, where he remained until late in 591. Next he joined YANG Kuang, the second son of the Emperor, at Chiang-tu in Kiangsu Province, where he stayed about four months. Early in 592 he returned to Lu-shan, whence he proceeded some half-a-year later to Nan-yüeh, then shortly thereafter to his old home, Chiang-ling. In the latter city Chih-i produced two of his best-known works, the *Fa hua hsüan i* in 593 and the *Mo-ho chih kuan* in 594. He paid Prince Kuang another visit at Chiang-tu in 595, then left the same year again for T'ien-t'ai. Very late in 597, while on the first lap of a third visit to Chiang-tu, Chih-i sensed the approach of death. Accordingly, he returned to his mountain monastery and died there amidst his disciples.

Chih-i's ideas were those of Mādhyamika Buddhism as understood to him from Chinese translations of Indian works and from certain Chinese forgeries. His philosophy was an epistemological ontology, one which had no concern with *das Ding an sich* but saw existence as it impinges on the mind in terms of a dialectical relationship. In this dialectical relationship, the thesis was the Mādhyamika tenet of impredicability, the antithesis was the phenomenal world; and the synthesis was the assertion of the identity of the first two. This synthesis in turn became the new thesis, the antithesis and synthesis were as before, and so

on *ad infinitum*. The order of these three terms, however, is not a chronological one, and Chih-i specifically insisted upon their mutual identity.

The phenomenal world, mentioned above, was subsumed under ten headings: nature, characteristics, substance, powers, functions, causes, conditions, effects, retributions, and the mutual identity of these nine. The ten states of existence preached by Māhāyana Buddhism (Buddha, bodhi-sattva, pratyekabuddha, *çrāvaka*, god, man, asura, beast, preta, and hell-dweller) he multiplied by ten, on the grounds that each of these states contains potentially all of the other nine. By viewing the world in three aspects, namely, that of the five skandhas, that of the beings, and that of the places occupied by these beings, and by multiplying these three by the hundred states of being and the ten attributes of the phenomenal world, he arrived at a figure of three thousand (the Grand Trischiliocosm). He held that where there is "a mustard-seed's quantity of consciousness," there is the world with all its diversity. He denied that either the world or the mind is prior, holding merely that, where there is the one, there inevitably the other must also be.

In order to reconcile the conflicting elements in Buddhism, Chih-i reconstructed the Buddha's preaching career as he imagined it to have been. The reconstruction was threefold: The first division was chronological, regarding each step as the precondition to the following step. The second was in terms of method and the third in terms of content, the respective method and content being gauged to the Buddha's particular listeners. But for Chih-i this was no mere historical problem. The purpose of the Buddha's preaching career was to lead all to Buddhahood, and Chih-i himself worked out an elaborate course of contemplation designed to lead the Buddhist practitioner to that goal. For him, intellection and contemplation were always indispensable each to the other.

Microfilm \$5.45; Xerox \$19.35. 427 pages.

THE CHRISTOLOGY OF WILHELM HERRMANN

(L. C. Card No. Mic 60-409)

David Royal Moorefield, Ph.D.
Duke University, 1959

Supervisor: Robert E. Cushman

The purpose of the dissertation is to present and critically analyze the Christology of Wilhelm Herrmann and to relate his interpretation to other leading schools of Christological thought. In carrying out this task the theological concepts of Herrmann which serve to clarify and justify his development of the doctrine are set forth. His concept of the moral predicament of man is presented without critical analysis. The relationship of his concept of revelation to man's plight is shown to be central for his understanding of religion. The concluding part of the first chapter outlines Herrmann's understanding of the task of Christology.

Chapter Two concerns itself with the means of obtaining a knowledge of Jesus Christ. The solution of this problem is of critical importance because the knowledge must be existential and historical, therefore non-

transmissible. The reasons for his refusal to accept the help of metaphysics in gaining this knowledge are presented. Herrmann's concepts of history and experience are analyzed and approved. His criticisms of "false" routes to a knowledge of Christ are sketched.

Chapter Three presents the theological interest in Jesus Christ. This deals with ground and content of the knowledge which faith possesses concerning Jesus. The distinction between the ground and the content of faith is clarified and defended. In this chapter is presented Herrmann's interpretation of the central tenets of the doctrine of Christ, namely, the Incarnation, Life, Ministry, Death, Resurrection, and Exaltation. It is shown that the Life and Ministry of Jesus are basic for the formulation of his concept of the inner life. The Death of Christ is interpreted as the completion of the Life and Ministry. The Resurrection is viewed as a means by which God restored faith to the disciples. The Exaltation belongs strictly to the realm of faith: Christ is seen as exalted only by those who find him ruling in their own lives. The chapter is concluded with an exposition of Herrmann's method of relating the doctrine of Christ to the doctrine of the Spirit.

Chapter Four deals with reactions to Herrmann's Christology from the last decade of the century until the present. Representative theologians as Oliver Quick, Albert Schweitzer, Rudolf Bultmann, Ernst Troeltsch, Karl Barth, James Robinson, Paul Tillich, and Oscar Cullmann are considered in juxtaposition to Herrmann where their work touches on related points of the doctrine of Christ. There is also a brief presentation of the reactions of other members of the Ritschlian School.

The conclusions reached are generally such as to warrant an approval of Herrmann's doctrine of Christ. In the field of Orthodoxy a positive development from Herrmann cannot be expected. The criticisms offered by the History of Religions School are so opposed to his understanding of religion that little can be expected from the mutual encounter. Herrmann refused the radical eschatological interpretation and remained in the main stream of modern Christological thought. The Barthian criticisms are found to be somewhat indefensible and the positive development in this theology is questioned.

In comparing Herrmann with Tillich, a large number of similarities are indicated. The conclusion is reached that the "New Being" is very closely related to the "Inner Life of Jesus."

The developments in Biblical theology seem to offer the richest and most fruitful field for an improvement and deepening of Herrmann's doctrine. This development was implicit in his demand for the preaching of the Bible. Cullmann's work is found particularly valuable in carrying out this task. Microfilm \$3.75; Xerox \$13.30. 292 pages.

THE PLACE OF CHRIST IN THE THOUGHT OF F. D. MAURICE.

(L. C. Card No. Mic 60-27)

John Francis Porter, Ph.D.
Columbia University, 1959

This analysis of the thought of Frederick Denison Maurice from the perspective of his Christology demonstrates how

his treatment of the person and work of Christ gave his theology its reconciling character. By viewing the life, death, and resurrection of Christ as the unveiling of personal relationship within the Godhead, Maurice was able to speak of a living foundation for the universe upon which the unity of men in society rests. The result was that his thought achieved an organic unity without the construction of a dogmatic system. Thus he perceived the fulfillment of his quest for unity in social and ecclesiastical affairs. What Christ did for men interprets what Christ is doing in men. The fact of redemption was put in the place of a "system of salvation." Church dogmas were treated as eliciting response to a living God rather than ideas to be supported by logic.

Particular attention is given to: the function of Christology in Maurice's theological method; his ability to rescue the insights of opposing theologies and philosophies because he saw them already reconciled in Christ; his mediation between liberalism and orthodoxy, revelation and reason, Catholicism and Protestantism, the Bible and science, fundamentalism and modernism, Christian and non-Christian religions. The perception of unity between the Old and New Testaments which such a Christology gave Maurice is shown in considerable detail. His clear and patient analysis of all the major questions of theology, sociology, politics and history from the perspective of Christology was not only the explanation of his prophetic and controversial career, but his permanent contribution to thought.

The introduction is largely biographical, indicating his discovery of Christological insights through Erskine and Coleridge and the shape Christology gave Maurice's ministry and piety. The first chapter, revelation, shows that looking at Christ as the incarnation of the Word and Son of God enabled Maurice to speak of Divine love and the Trinity as living reality known by "induction." In the second chapter, Maurice's viewing of the Son as creative agent is taken up, with special emphasis upon his concept of Christ the Head of Man. Incarnation reveals the relationship in which "all things stood from the beginning," and gives substance to the idea of divine image. Christology furnishes an interpretation of selfhood, anticipating Martin Buber, and permits a re-evaluation of the traditional doctrines of original righteousness and divine election.

Chapters III, IV, and V treat Maurice's view of the work of Christ, beginning with a presentation of Christ's death as the fulfillment of Old Testament sacrifice. Maurice's treatment of the sacrifice of the Divine Son as reconciliation, redemption, victory, judgement, and the revelation of the Fatherly care of God is analyzed against the background of both legal satisfaction and moral influence theories of the atonement. His method of affirming the actual "fact of atonement against all theories about atonement," is valid for today.

Maurice's peculiar version of realized eschatology and his use of it as the foundation for a doctrine of history is the subject of Chapter VI, which introduces Maurice's great emphasis upon the Ascension of Christ as the foundation of the Christian Gospel. His activity in the Christian Socialist Movement is put in the perspective of his Christocentric social ethic in Chapter VII. The vision of the institutional Church and her forms as the permanent, living witness to man's relationship to God in Christ (Chapter VIII) revealed a way out of sectarianism to Maurice. He envisaged an ecumenical vocation for Anglicanism and laid a foundation for ecumenical theology.

A concluding note examines some of the criticisms of Maurice, especially that of Platonism and an underestimation of sin. Microfilm \$4.15; Xerox \$14.65. 322 pages.

SHAILER MATHEWS: THEOLOGIAN OF SOCIAL PROCESS.

(L. C. Card No. Mic 60-272)

Kenneth Lee Smith, Ph.D.
Duke University, 1959

Supervisor: H. Shelton Smith

This thesis is an examination of the religious thought of the Baptist theologian, Shailer Mathews, Professor of Historical Theology (1906-1933) and Dean of the Divinity School of the University of Chicago (1908-1933). His activities and writings epitomized the principal aspects of the history of Protestantism in America during the first three decades of the twentieth century. Special attention is devoted to the idea of "social process" which is held to be the integrative concept of his system of thought. After an account of his early years and the formative influences, an attempt is made to show the influence of the idea of "social process" upon the following areas of his thought: God, sin, Christology, the Kingdom of God and history, and the nature and function of the Church. In the conclusion we have attempted to assess Mathews' thought in the light of recent trends in theology and ethics.

The atmosphere in which Mathews was reared was marked by the Evangelical Orthodoxy, Puritan morality, and social conservatism which prevailed in New England during the decades immediately following the Civil War. It was an atmosphere unaffected by either skepticism in religious thought or radicalism in economic practices. The education obtained at Colby College and Newton Theological Institution was largely a projection of the attitudes inherited from the home, school, and church. By the turn of the century, however, Mathews had come to the conclusion that Protestantism had entered a period of crisis. He held that the crisis was the consequence of the hiatus between the world-view of Orthodox Protestantism and the outlook upon the world provided by the physical and social sciences, especially biology and sociology. Thus he urged that an attempt should be made to restate the "generic principles" of Christianity in terms consonant with the modern view of reality.

In his attempt to restate the "generic principles" of Christianity Mathews utilized the so-called socio-historical method. He was one of the first Protestant thinkers in the United States to use this method to interpret Christian theology. In doing so he produced a new version of Christianity which he called "Modernism." Briefly stated, there were two fundamental steps in the socio-historical method, historical analysis and constructive interpretation. In the first step, Christian doctrines were studied in terms of the social matrix in which they arose. This procedure assumed that the only test of the validity of a doctrine was the pragmatic one of efficient performance of function. In the second step, the "generic principles" were reinterpreted in terms of the "social mind" of the twentieth century. According to Mathews, the contemporary social mind had two components, science and democracy. Most of

Mathews' writings represented endeavors to reinterpret the doctrines of traditional theology, using the social patterns afforded by science and democracy.

The central idea in Mathews' theology was the Kingdom of God. He conceived the Kingdom of God in terms of a social order which would fully incorporate the ideals of democracy. His thesis was that Jesus enunciated the principle of love, through the implementation of which the Kingdom would be realized. He believed that definite progress had been made toward the realization of the ideal of Jesus in the institutions of democracy. In the sense that this was true the Kingdom is already present. But since the ideal of Jesus has not been fully realized, the Kingdom is still in the future. Accordingly, the absolute actualization of the Kingdom depends upon the further extension

of democracy. The social conception of the Kingdom of God determined Mathews' interpretation of the nature and function of the Church. That is to say, he understood the nature of the Church in terms of sociological and institutional development, and the function of the Church in terms of the "Christianization" of the social order. To this end, he suggested that the program of the Church should be geared to the creation of an ever-widening circle of Christian society, including a Christian home, a Christian commercial life, a Christian educational system, and a Christian political structure in city, state, nation, and the world. The Church was viewed, therefore, as a means to an end--the means of the realization of the Kingdom of God on earth.

Microfilm \$4.30; Xerox \$15.10. 333 pages.

SOCIAL PSYCHOLOGY

THE ANALYSIS OF ROLE CONFLICTS IN A COMPLEX ORGANIZATION: THE POLICE.

(L. C. Card No. Mic 60-547)

Howard Jay Ehrlich, Ph.D.
Michigan State University, 1959

Major Professor: Jack J. Preiss

The specific focus of this dissertation has been upon one aspect of role behavior -- role conflict. The initial task undertaken was that of the development of a conceptual scheme for the analysis of role conflict wherein an attempt was made to specify some dimensions for the analysis of role conflict as well as to delineate the problems and propositions of role conflict analysis. Through research, and not merely by continued logical refinement, the attempt was then made to demonstrate the empirical significance of selected aspects of this newly developed conceptual scheme. The findings relative to this objective may be summarized as follows, subject to the substantive limitations specified in the text of this dissertation.

1. It was demonstrated that status incumbency is not a sufficient condition for the perception of exposure to contradictory expectations.
2. The actor's perception of exposure to contradictory expectations is itself not a sufficient condition of ambivalence.
3. Expectations which are legitimate tend also to be obligatory; and, conversely, non-legitimate expectations tend to be non-obligatory.
4. Corollary with the above, legitimacy and obligation stably manifested an intermediate, positive, and statistically significant association.
5. Competing legitimate and or competing obligatory expectations tend to be associated with greater ambivalence than other patterns of legitimate and obligatory expectations.
6. Role conflict resolution can be successfully predicted from legitimacy and obligation.
7. The predictability of role conflict resolution on the

basis of legitimacy and obligation varies significantly with degree of ambivalence.

8. The predictability of role conflict resolution on the basis of legitimacy and obligation appears to vary significantly with type of situation.

9. Consensus on audience group expectations and consensus on the legitimacy and obligatoriness of these expectations stably manifests a high, positive, and statistically significant association.

In view of the decided consonance of these findings with the conceptual scheme presented, it was proposed that the scheme remain intact subject to further research.

Microfilm \$2.50; Xerox \$6.00. 124 pages.

FACTORS ASSOCIATED WITH WHITE PARENTS' ATTITUDES TOWARD SCHOOL DESEGREGATION IN A CENTRAL FLORIDA COMMUNITY

(L. C. Card No. Mic 60-745)

Robert Walter Greenfield, Ph.D.
The Ohio State University, 1959

The problem of this study was to develop and utilize methods and techniques for assessing the attitudes toward the public school desegregation of a culturally heterogeneous central Florida population and to relate these attitudes to selected social background characteristics. It is hypothesized that attitudes toward school desegregation of white parents of school children in Winter Park, Florida, vary widely but are predominantly unfavorable; those who are favorable to desegregation are characterized by high educational achievement and high prestige of occupation; by Northern birth, socialization, and identification; by a short period of residence in the South and relative youth; while those unfavorable to desegregation are of lower educational achievement and relatively low occupational prestige; are of Southern birth, socialization, and identification; are long-time residents of the

South, and are relatively older than their favorable counterparts.

A Likert scale was constructed by the method of internal consistency to measure attitudes toward desegregation, and an information sheet to record background characteristics was developed. Items were constructed from interviews, related scales, and the literature. The scale was pretested once in central Florida and again with a college student sample in Atlanta. Pretest split-half reliability coefficients are .958 and .957 for the twenty-four item scale.

A modified area sample of the entire population of parents of white school children was designed, and 318 interviews, 309 of which were usable in final data analysis, were completed. The scale was read to respondents, who indicated anonymous answers on a separate sheet.

Data analysis showed the sample to be predominantly female, of relatively high education and of high occupational prestige as measured by the North-Hatt Scale of Prestige of Occupations; they are relatively young and heterogeneous with regard to regional origin, socialization, length of residence in the South, and self-identification with a region.

Frequency distributions of scale scores indicated that the first major hypothesis is substantiated; attitudes vary widely but are predominantly unfavorable.

The hypothesized relationships between background characteristics and attitude toward desegregation were tested by constructing contingency tables utilizing extreme quartiles of scale scores and appropriate categories of background factors. Chi square was computed for these relationships. The data tend to substantiate the hypotheses with some qualifications. Those in favor of desegregation tend to be of relatively high educational achievement, although there is an almost even distribution of college graduates having favorable and unfavorable attitudes; are split between high and low occupation prestige; are predominantly Northern born and brought up; have lived a short time in the South; do not differ from the other group in age; and are split between refusal to identify with a region and identification as Northerner or Southerner. Those unfavorable to desegregation are of lower education and relatively low occupational prestige; were largely born and socialized in the South, and have lived a large percentage of their lives there; are of the same age distribution as their favorably disposed counterparts, and overwhelmingly identify as Southerners.

Comparisons of these findings with related studies indicate that they are not inconsistent with those reported elsewhere in the literature.

Microfilm \$2.50; Xerox \$6.00. 125 pages.

SELF-IMAGE OF COMPETENCE, PEER-RELATIONS AND ANOMIE IN A GROUP OF 10TH GRADE GIRLS.

(L. C. Card No. Mic 60-508)

Janet T. Leckie, Ph.D.
New York University, 1957

Adviser: Dr. Marie Jahoda

The purpose of this study was to test whether three aspects of personality: self-image, values, and peer-

relations, vary systematically with each other. These are complex variables, and an empirical study can select only a few limited aspects of each. Therefore, the focus chosen for this study was: a sense of personal competence as the selected aspect of self-image; acceptance and/or rejection by the group as the selected aspect of peer-relations; and the absence of unifying beliefs, anomie (in Durkheim's sense), as the selected aspect of values.

The subjects were 292 girls at the High School for Fashion Industries, in New York City. Most of the girls were 15 or 16 years of age.

Data on self-image of competence were collected by means of a card sort, based on the Foote and Cottrell concept of competence in interpersonal relations. Six areas of competence were included in the test: health, intelligence, empathy, autonomy, judgment, and creativity. Each of the areas of competence was represented by ten negative and ten positive items. Data on anomie were collected by means of a paper and pencil test. The anomie items were administered as part of a "Teen-age Opinion Survey." Data on peer-relations were collected by means of a sociometric paper and pencil test. The subjects were supplied with a numbered list of their classmates and a form with five spaces for choices and five for rejections. They were asked to indicate, on the form, those girls they would like to have in their group, and those they would prefer not to have included in it.

The general hypothesis to be tested was: A positive self-image of competence and the absence of anomie are related to acceptance by peers. The following were the detailed hypotheses:

- 1a. Girls with a high score in self-image of competence will be low in anomie; and conversely, those with a low score in self-image of competence will be high in anomie.
- 1b. Girls with a low score in anomie will be overchosen and under-rejected by their peers; and conversely, those with a high score in anomie will be underchosen and over-rejected.
- 1c. Girls with a high score in self-image of competence will be overchosen and under-rejected by their peers; and conversely, those with a low score in self-image of competence will be underchosen and over-rejected.
2. Girls with a high score in self-image of competence and a low score in anomie will be overchosen and under-rejected by their peers; and conversely, those with a low score in self-image of competence and a high score in anomie will be underchosen and over-rejected.
3. Girls who score neither consistently high nor consistently low in self-image of competence, but who are low in anomie will be more accepted and less rejected than girls from the same group who are high in anomie.
- 4a. Minority group members will score lower in self-image than majority group members.
- 4b. Minority group members will score higher in anomie than majority group members.
- 4c. The relationship of self-image, anomie and peer-relations (compare hypothesis 2) will be less outspoken for minority groups than for majority groups.

Certain questions involving peer-relations were raised, without establishing hypotheses. These questions involved intensity of choice and rejection. It was thought that variations in the patterning might be related to significant differences in self-image and anomie. The patterns chosen for investigation were: high choice, low rejection; high rejection, low choice; high choice, high rejection; low choice, medium rejection; low rejection, medium choice; low choice, low rejection.

The significance of the results was tested, in most of the hypotheses, by means of chi-square or analysis of variance. Because of difficulties in the distributions involving hypothesis 4c, chi-square analysis was not feasible. As a consequence, a rough idea of the relationships was obtained by means of tetrachoric correlations.

Those parts of the hypotheses which involved rejection status failed, in each case, to show a relationship with the other variables. Also, hypothesis 3, was not sustained, although the findings were in the predicted direction. For reasons indicated before, hypothesis 4c could not be rigorously tested. The remaining hypotheses were sustained at better than the .01 level.

The open questions, involving intensity of choice and rejection, revealed differences among the patterns, in terms of self-statements, tendency to reject, and appraisals by others. A number of suggestions were made for further investigation.

Microfilm \$2.50; Xerox \$6.00. 123 pages.

HUMAN ENCOUNTER, PERSONALITY TYPES, AND IMPLICIT THEORIES OF PERSONALITY.

(L. C. Card No. Mic 60-397)

Leonard LeRoy Smucker, Ph.D.
University of Southern California, 1959

Chairman: Professor Eitzen

Western man's devotion to scientific and technological advance concomitant with a prevailing philosophy which tends to separate man as subject from man as an object, has left a void in his understanding of himself and his relationship to others. While on the surface he appears to be immersed in a great variety of social activities and concerns, at a deeper level Western man has become alienated from himself and his fellow. This is both a theological and a social-psychological problem.

The present investigation was concerned with one aspect of man's relationship with man, namely, interpersonal attraction among strangers. Its purposes were (1) to test certain hypotheses regarding the relationship of "real" and "assumed" similarity to interpersonal attraction among strangers and (2) to explore the nature of the perceptual categories—implicit theories of personality—employed in free descriptions of self and others.

The major hypotheses were as follows:

1. Among strangers, persons will find it less difficult to form personal relationships with others of a similar type ("real" similarity) than with those of a dissimilar type.
2. Among strangers, persons will designate accurately, significantly more often than inaccurately, others who are similar to themselves with regard to type.

3. Among strangers, persons will find it easier to form a relationship with another whom they perceive to be similar ("assumed" similarity) to themselves than with another whom they perceive to be dissimilar.

4. Among strangers, a person who feels warmer toward another will also perceive that person to feel warmer toward him.

A test purported to indicate personality type (The Myers-Briggs Type Indicator) was administered to 316 women students from three Southern California colleges. From this pool, forty three-person groups were selected. The members of each group were matched on the variables of sex, age, marital status, nationality, undergraduate status, socioeconomic status, mental ability, and absence of previous relationship. In addition, each group contained two persons of a similar type and one person of a dissimilar type. Questionnaires designed to test the various hypotheses were administered separately to the members of each group both before and after their encounter. The only instruction given for the fifteen-minute interaction was as follows: "The purpose of the 'meeting' is to see to what extent three strangers can come to know each other in a brief space of time."

Analysis of the results by the chi-square method refuted hypotheses one and two and supported hypotheses three and four beyond the .001 level of significance. Results of the exploratory phase of the study indicated a significant relationship between the categories one uses in describing himself and the categories one uses in describing others.

Beyond the specific results of the investigation and their implications as discussed, a major conclusion concerned the need for originality and ingenuity in methods of studying "normal" persons and their relationships. The student of psychology and religion is in a particularly favorable position to employ idiographic methods. His unapologetic respect for personality and his concern for genuine human encounter equip him to study empathically qualities of human experience.

Microfilm \$2.75; Xerox \$9.45. 210 pages.

RELIGIOUS ATTITUDES OF PHYSICIANS AND DISEMINATION OF CONTRACEPTIVE ADVICE

(L. C. Card No. Mic 60-47)

Sydney Shepherd Spivack, Ph.D.
Columbia University, 1959

This study is concerned with the attitudes of physicians toward the control of human fertility and their corresponding practices; it focusses on the religious factors which may influence the behavior of the Catholic physicians since the doctrines of the Roman Catholic Church forbid the use of chemical or mechanical contraception.

The physicians were selected on the basis of characteristics of the community in which they practice: urbanism, educational and income level and the proportion of Catholics in the population. Obstetricians, gynecologists, internists, and general practitioners were interviewed for over an hour each in six areas and then properly combined in a weighted sample. In the total weighted sample there are 1,023 physicians of which 244 are Catholic. The average refusal rate was 10 per cent.

A variety of attitudinal and behavioral questions were asked of both Catholic and non-Catholic physicians, e.g., moral or medical standards for use of contraception, belief in optimal interval between child births, most reliable contraceptive procedure, responsiveness to requests for contraception by both Catholic and non-Catholic patients and responsiveness to patients in a variety of hypothetical situations. Among non-Catholic physicians, 97 per cent approve of the use of device-contraception, as compared to 24 per cent among Catholic physicians.

To summarize the attitudes and behaviors that were measured in the study, a fourfold typology was constructed with one dimension attitudinal and the other dimension behavioral. Three of the four possibilities actually occurred in the sample of Catholic physicians: the "conformers" who agree with Church doctrine and who do not advise on device-contraception (47 per cent); the "accommodators" who agree with Church doctrine but who nevertheless give advice (24 per cent); and the "dissenters" who disagree with Church doctrine and who give contraceptives (29 per cent).

A variety of religious, medical and secular influences are then measured to see which relate either to conformity or dissent. A number of Church-linked role relationships in both the Catholic physician's past and present environment, e.g., Catholic post-high-school education, church attendance, hospital affiliation and proportion of patients Catholic are found to have the strongest relationship. While

association with any religious institution is associated with conformity, the most powerful relationships are frequency of church attendance, affiliation with a Catholic hospital, and attendance at Catholic training institutions.

A number of secular influences, e.g., occupation of father, country of father's birth, nature and number of civic and social organizations, number of professional societies, income, age, etc. are considered. However, aside from age, none of the secular influences is significantly related either to conformity or dissent.

In addition, a number of medical influences are analyzed, e.g., frequency of post-partum examinations, of gynecological cases, of pelvic examinations, etc. Even when controlling for the relevance of the specialty, there is little association between exposure to such situations relevant to family planning and either dissent or conformity. The physician's behavior is highly associated with his perception of the prevalence of use of contraception, both in the community within which he practices and among his own patients. The conformer tends to perceive the use of contraceptives to be low and Church-approved methods to be more frequently used. The dissenter "sees" a high prevalence of use of contraceptives and chemical-mechanical methods as those most frequently used. Thus the doctor's image of what goes on among his patients and in the community with respect to family planning tends to congruence with his own attitude and behavior.

Microfilm \$4.45; Xerox \$15.75. 346 pages.

SOCIOLOGY

SOCIOLOGY, GENERAL

AN EVALUATION OF THE RURAL DEVELOPMENT PROGRAMS OF IRAQ

(L. C. Card No. Mic 60-606)

Hassan Kadhum Al-Bassam, Ph.D.
Cornell University, 1959

The central concern of this study has been the rural people of Iraq and the various programs of rural development established in the last decade by the government and foreign technical assistance agencies to help improve their living conditions. The study was also designed to determine the reasons for the failure of the various programs of rural development to help the rural people overcome the problems of poverty, disease and ignorance.

An intensive examination of all the available documentary evidence, supplemented by interviews with experts who have been closely connected with the rural development programs of Iraq, is the foundation of the research method used in this study. The writer also drew upon his own experience in the field and had recourse to materials collected while working for three years in the rural development program.

The thesis has been divided into two parts. In part I, the social and economic systems of rural Iraq are discussed and analyzed. The study reveals that the rural

society of Iraq is largely traditional and tribal in character. It is a highly integrated society in which there is a close interplay between agriculture, religion and social relationships. Consequently, it is not a society oriented to change, but is, in fact, highly resistant to it. The rural economic system is based entirely upon agriculture. The majority of the farmers do not own land. They work as sharecroppers and pay from 25 to 70 per cent of the produce to the landlords. Agricultural productivity is low. Scanty and irregular rainfall in the north, primitive and crude methods of farming, as well as the nature of the social and economic system are among the major reasons for the low crop yields.

In part II, four rural development programs have been studied. These were the agricultural extension program, the village development program, the fundamental education program at Dujailah, and the rural improvement project at Shaglaw. The first two were nationwide programs; the last two were pilot projects limited to specific areas. Special attention was paid to the course of events which led to the establishment of these programs, the methods used in their implementation, and an evaluation of each program's approach to the development of rural Iraq.

All these programs have had one objective in common which was to further rural development. This was attempted either by increasing agricultural production and efficiency, by improving the level of living through the

provision of adequate health and educational services, by fighting illiteracy, or by creating self-reliance and initiative for effective local action.

This study has revealed that:

1. There was too much dependence upon foreign technical assistance.
2. None of the programs had a full coverage of the country.
3. All suffered from inadequate trained personnel and from lack of essential facilities.
4. The basic purpose of the programs had either been rejected or modified to suit the superior attitude of the elite toward the rural masses.
5. Involvement of and participation by the people was extremely limited.
6. The programs were not anchored in the cultural base of the people and so lacked stability and effectiveness.
7. Lack of coordination and cooperation between the departments working with the rural people was a common problem to all four programs.
8. The land-tenure system was a major obstacle to the achievement of the objectives of the programs.
9. There was a lack of genuine interest and support on the part of the government.
10. None of these programs were able to attain the desired objectives. All that was accomplished was the provision of limited services to not more than thirty per cent of the rural population.

In the light of what is known about rural development in such countries as Iraq the above finding would seem to be ample evidence to explain the failures described in the thesis. Therefore, recommendations were made to improve and strengthen such programs.

Microfilm \$5.20; Xerox \$18.25. 405 pages.

RATIONAL INTRODUCTION OF TECHNOLOGY ON A COSTA RICAN COFFEE HACIENDA: SOCIOLOGICAL IMPLICATIONS.

(L. C. Card No. Mic 60-544)

Antonio Manuel Arce, Ph.D.
Michigan State University, 1959

Major Professor: Dr. Charles P. Loomis

This is a sociological study of change, as it relates to some aspects of agriculture and rural life. Its central problem has been the study of some changes in an hacienda social system, brought about by the rational introduction of technology; conversely, the study of some of the influences of the existing social structure and culture of this coffee hacienda on the rational introduction of technology.

The theoretical model of the social system guided the investigation from its beginnings. The basic assumption of the study was that a change in the ends or goals of an hacienda produces changes in other elements of the social system.

Some of the general findings of the study are: the hacienda changed its general orientation after 1953, year in which occurred a change in its ownership. The new goal made explicit by the new patron was to make the farm produce at its maximum. In order to fulfill this goal, the

patron has rationally applied clearly defined means. The two more important of these means are: the elimination of the colono system and modifications in coffee technology.

The elimination of the colono system has had some consequences in the pattern of land tenure of the hacienda, since two thirds of the 520 manzanas planted in coffee before the change in ownership were cultivated by colonos. Now the totality of land planted in coffee are being cultivated by peons. The elimination of the colono system has not fundamentally affected the size of the population but it did affect the population composition considerably, especially in terms of occupational categories. Spatial mobility has been relatively low for the hacienda as a whole and relatively high for the colono occupational category.

The structure of the hacienda agricultural system has been fundamentally modified by the application of means in the fulfillment of the new goal. This modification has affected, in part, the authority pattern of the hacienda.

The findings presented in relation to coffee technology show that of a list of 33 practices in coffee, 18 were being carried out in Aquiares. One third of these practices were new. Systematic study of two practices, one new and one modified revealed that the degree of acceptance of a practice is a function of values, beliefs, sentiments and customs. This means that when a practice conflicts strongly with basic values, beliefs, sentiments and customs of the probable adopter, the chances of its acceptance by him are minimum.

The findings presented show, in general, that the hacienda is now producing more coffee than before: 17.53 fanegas per manzana now, as compared with 12.0 fanegas per manzana before the change in ownership of the hacienda. This suggests that the hacienda is moving towards the attainment of the goal.

The assumption that a change in the ends or goals of an hacienda produces changes in other elements of the social system seems to be supported by the findings of this study. Microfilm \$3.15; Xerox \$11.05. 243 pages.

DEVELOPMENT OF SOCIOLOGY IN JAPAN: A STUDY OF ADAPTATION OF WESTERN SOCIOLOGICAL ORIENTATIONS INTO THE JAPANESE SOCIAL STRUCTURE.

(L. C. Card No. Mic 60-402)

Changboh Chee, Ph.D.
Duke University, 1959

Supervisor: Donald F. Roy

This thesis attempts to prove the hypothesis that the development of sociology is determined by the structure of the sociocultural components of the society. The basic theoretical framework of this study of the adaptation of Western sociology into the Japanese social structure was largely drawn from the "actor-situation" and "structural-functional" theory. The adaptation process must be understood as a subjective-intensive social action toward value-defined goals which meet the social necessities of Japanese society, not as a blind imitation of Western cultural elements.

Adaptation of Western sociology and development of sociology in Japan are a historical continuity. Adaptation of each sociological orientation of the West must be understood in the light of the continuing functional relations of sociology to the continuing structural change of the Japanese sociocultural context. The historical continuity of the adaptation will be discussed in the following divisions: the spirit of the Meiji Restoration and its influence upon the rise of a liberal social thought, the development of encyclopedic and organic sociology, the influence of German formal and cultural sociology, the movement to develop Japan's own sociology under the ultranationalistic conservatism of World War II, and the influences of American sociology upon postwar Japanese sociology.

The rise of a new liberal social-political thought in the Meiji regime, Ziyu Minken Ron, created a favorable climate for an importation of Western liberal social philosophy, including the encyclopedic and organic sociological theories of Spencer and Comte. In the course of the development of Japanese ultranationalistic expansionism in the last decade of the nineteenth century, the Spencerian and Comtean sociologies were largely utilized as defensive rationalizations by the conservative, individualistic elements of the society.

As a result of her victorious war experiences in the 1900's, Japan rapidly developed a more static and non-political status-quo social structure in which a psychological sociology was conceived. During this period sociology attempted to construct its own scientific orientation in the name of "sociology as a special social science." In this movement, German formal sociology exerted a great influence upon Japanese sociology, which sought a systematic study of only the forms of social processes within the frame of the existing status-quo social structure. German cultural sociology of "volk" had also brought about a rise of Japanese cultural sociology of the State and of Japanese rural community and culture in the 1930's. By this movement, which avoided a direct attempt to reconstruct the total social structure, sociology itself was able to survive the critical war years.

After 1945 the socio-economic and cultural contexts of the postwar social structure of Japan changed drastically; as a consequence Japanese sociology has come under new perspectives. A trend toward an empirical-research and positivistic sociology and away from the prewar arm-chair type "Kathedersozologie" has become evident.

In an attempt to analyze and study the complexity of modern society, Japanese sociology has begun to adapt American sociology by emphasizing the importance of empirical research in specialized fields; such as, industrial sociology, social mobility research, small group study, and the bureaucratic system. Following American trends, Japanese sociology has also been attempting an interdisciplinary association with the social sciences, especially with cultural anthropology and psychology. Further evidence of this trend is the movement toward "middle range" sociology and "interpenetration" of microscopic sociology and theoretical sociology in the name of the macroscopic "third sociology."

A hopeful prospect for the future of Japanese sociology seems apparent in both the domestic and international spheres; however, its future success will depend largely upon the development of a macroscopic sociology based on the social structure of Japan's own "total society" rather than on a mere imitation of Western sociologies.

Microfilm \$3.75; Xerox \$13.05. 289 pages.

SATISFACTION OF WIFE WITH HUSBAND'S JOB

(L. C. Card No. Mic 60-727)

Carolyn Clement Comings, Ph.D.
The Ohio State University, 1959

Three samples of wives in the Columbus area were interviewed. A pilot study of fifty interviews confirmed the selection of basic variables chosen from previous job satisfaction studies. Satisfaction of the wife was related directly to these variables: husband's job type, husband's education, and family income. Where satisfaction was high, placement of families on these variables also was high.

A second sample of one hundred cases was drawn from Census Tracts and blocks of average dwelling unit valuation for the city. The aim was to interview wives whose husbands' job types, education of husbands, and family incomes varied within limits; thus satisfaction of wives might be studied for other related variables.

High and low score groups on a ten-item satisfaction measure were used to identify differentiating items. The six best items were used in a summated score for all wives. This score was cross-tabulated against items in three main areas: job-related variables, a limited set of social factors, and a set of residence items. There were separate hypotheses regarding the types of correlation expected.

A third sample of fifty wives was interviewed to supplement those previously obtained. Three groups of fifty, scoring high, medium, and low on satisfaction, were found significantly related by Chi-square testing to five variables, the basic three plus a comparative education item and place of birth of wife. Other differences were identified by relating satisfaction to education of wives and to their social participation. Differences existed also between the wife's score associated with husband's place of birth and his job history. Satisfaction of the wives was high with longer period of marriage and longer residence in the present location, but did not relate to home ownership.

From the twenty-five separate questions about the husband's job, results on ten were useful for index purposes. A job index score based on summated ratings of these ten items was assigned to each of the husband's jobs. Correlation between satisfaction scores and job items showed a low positive relation for a total of 150 wives. Knowing that a relation existed between satisfaction scores and job items, a next step was to determine whether the three basic variables varied consistently with scores on both measures. Cases high on both satisfaction and job index and cases low on both measures were studied separately to determine whether job type, education, and income would be parallel. It was found that for scores in the extreme quartiles, these variables closely reflected the score pattern.

Microfilm \$2.50; Xerox \$5.80. 118 pages.

THE LIVINGSTONS OF NEW YORK 1675-1860: KINSHIP AND CLASS.

(L. C. Card No. Mic 60-13)

Patricia Joan Gordon, Ph.D.
Columbia University, 1959

In this study of six generations of the Livingston family, the focus is on their behavior as cause and consequence of their class and status position. The three major questions asked are: What were the actions that enabled this family to attain an upper class position? Once such a position had been achieved, what patterns of behavior adopted by succeeding generations stabilized this class position? What was the nature and degree of family cohesion, and what were the determinants of this cohesion?

The sources of data were family manuscripts available to the public, genealogies, family histories, and public records and documents.

The first member of the family to arrive in this country, Robert Livingston, achieved an upper class position through holding minor but strategic public offices, marrying into the upper class, and acquiring 160,000 acres of land which became Livingston Manor. Robert's three sons founded three branches of the family, two of which were propertied. The research is primarily concerned with the propertied lines, the non-propertied branch being introduced for comparative purposes.

Among the patterns decisive for establishing and maintaining the family's upper class position are the following:

1. Later generations, like the founder, acquired great tracts of land in central and western New York. Rent from land was a major source of income and capital. After the fourth generation, real estate in New York City attracted large investments. In addition, other sources of profitable investment were sought out. This led to economic innovation, such as establishing the first iron works in New York and financing the first steamboat in America.

2. Ownership of land and the development of business enterprises were frequently undertaken as family rather than individual enterprises. Economic activities of individual family members were always coordinate rather than competitive.

3. In the first four generations, economic roles were carefully integrated with political roles.

4. Fathers of the early generations spent time and effort training their sons to be self-reliant, rather than permitting them to be content with the status ascribed to them as members of a wealthy and politically powerful family.

5. Family members, particularly children, were considered resources to be deployed in the family interest. The large family in the colonial period enabled the Livingstons to become entrenched in the most important social institutions.

6. Political and economic questions were considered matters for family, not individual decisions. Family members spent much of their time in each other's company, aided one another, and acted to control the occasional deviant.

7. Primogeniture and entail insured that the core of the family fortune would be handed on intact to the early generations, and served a major function in family cohesion.

8. When equal division of property was instituted in the fourth generation, members of the family began to view each other with suspicion.

9. The behavior of the fifth and sixth generations was in marked contrast to that of the earlier ones. The Livingstons withdrew from politics, retired from active involvement in the industrial economy and lived on their investments. They married relatives or within a very narrow circle of New York families of equally old wealth. They had few children. They established or joined the most exclusive clubs. These changes are interpreted as responses to the threats posed to their upper class position by the democratization of political institutions, the rise of new wealth, and the fragmentation of Livingston property through equal division among the children.

10. The non-propertied line did not achieve comparable class positions. What little property there was was divided equally among the children from the beginning. On the whole, this branch of the family was spatially more mobile, displayed greater occupational diversity, had fewer children, lost contact with the propertied lines, and gave little evidence of family cohesion.

Microfilm \$4.50; Xerox \$15.75. 350 pages.

THE RELATIONSHIP OF CHANGES IN ROLE PLAYING ABILITY TO CHANGES IN CERTAIN SOCIAL VALUES: A STUDY OF THE RELATIONSHIP OF CHANGE IN ROLE PLAYING ABILITY DEVELOPED IN THE COURSE OF A ROLE TRAINING PROGRAM TO CONFORMITY TO GENERAL SOCIAL VALUES.

(L. C. Card No. Mic 60-498)

Martin Roy Haskell, Ph.D.
New York University, 1957

Adviser: Professor Henry J. Meyer

Implicit in the theoretical positions of Mead and Cottrell is the existence of a relationship between taking the role of other and conformity. Mead, Sarbin, and Moreno indicate that role playing is a method of learning to take the role of other. Studies reported by Harrow, Jones and Peters, Sause, Janis and King, Rosenberg and others indicate modifications in attitudes, perceptions, and behavior result from role playing experience.

A Role Training Program was administered for a period of three months to a group of inmates of the Riker's Island Penitentiary selected from one hundred and seven inmates whose release was anticipated to be between November 27, 1956 and December 21, 1956. Excluded were: 1) those with less than sixth grade reading ability; 2) those under the age of twenty or over forty-one; 3) known homosexuals; 4) inmates with major warrants pending. The remaining sixty-six were divided alternatively from alphabetical listing, into experimental and control groups. The thirty-three inmates assigned to the experimental group were divided into two training groups of sixteen and seventeen members.

Role Training was defined as a form of role playing in which emphasis is placed on the reenactment of performances in past experiences and in which psychodramatic instruments and techniques are employed. The Role Training Program consisted of fifteen training sessions directed toward the following role relationships:

1. Occupational Roles: Job Applicant - Employer; Worker - Co-worker; Worker - Foreman; Worker - Employer; and Worker - Union.

2. Family Roles: Son - Mother; Son - Father; Brother - Sibling; Husband - Wife; and Relative. (Cousin, Nephew, etc.)

3. Community Roles: The individual in his relationships with persons at School, at Church, with Neighbors, with Friends (former friends and the making of new ones), and with Parole Officers.

Prior to instituting the Role Training Program, each experimental and control group member was given five tests which were repeated after the training program. These were:

1. Role Test - A test of role enactment rated by three judges.

2. Empathy Test - Subject was rated on the accuracy with which he predicted the rating made by the auxiliary ego of his performance.

3. Human Relations Inventory - A projective test designed to measure tendencies toward conformity to social values.

4. Judgment in Social Situations Test.

5. Observation of Human Behavior Test.

The following hypotheses were tested: Compared to the control group, inmates given Role Training would:

1. Display greater ability to play roles.
2. Display greater ability to take the role of other.
3. Display greater tendencies toward social conformity.
4. Display better judgment in social situations.
5. Display greater ability to observe human behavior.
6. Make a more satisfactory economic and social adjustment on release.
7. Have a lower rate of recidivism.

In addition it was hypothesized that persons improving in role playing ability would show greater improvement on each of the other tests than non-improvers.

The following table of t-scores summarizes the results of the tests:

	ROLE TEST	EMPATHY	HUMAN RELATIONS INV.	JUDG- MENT	OBSER- VATION
t-score	4.06*	1.03	1.86*	.33	.179

*Significant at .05 level.

The eighteen improvers on the Role Test improved significantly on the Empathy Test ($t = 2.33$) and on the Human Relations Inventory ($t = 3.78$) when compared with the ten non-improvers.

CONCLUSIONS

The Role Training Program can be said to have improved considerably the subjects' ability to play roles. Attitudes toward social values were modified in the direction of conformity. Improvers in role playing improved in Empathy and tendencies toward conformity when compared with non-improvers.

Microfilm \$2.50; Xerox \$6.40. 133 pages.

THE EXERCISE OF INFLUENCE IN SMALL GROUPS

(L. C. Card No. Mic 60-32)

Terence Kilbourne Hopkins, Ph.D.
Columbia University, 1959

The essay describes a process whereby varying degrees of influence are continually distributed among the members of a small group.

First, several basic concepts are introduced. Small group is defined as a phenomenologically real social system characterized by an absence of stable subgroups and a high degree of visibility. The active unit of this type of social system is the member, which differs from the individual person in two respects: it includes only a segment of the person, specifically, that part of him engaged in the group, and it includes also the expectations held by all the participants concerning what attributes any one of them should display and what actions should be performed. Such members are described as differing from one another in only five respects, their relative influence, rank, centrality, observability, and conformity. All other differences are ignored. Influence, defined as the result of actions on the group's state of normative consensus, is exercised by a member if his actions have the effect of reinforcing consensus or of altering it in one of several ways. This concept of social influence is compared with that of personal influence, and several ways of measuring it are described. Finally, since the distribution of social influence among the members is held to depend upon the distributions of the other four properties, each of these is defined and ways of measuring them are discussed.

In the second part, propositions linking the four properties to one and to influence are stated. Each assertion is weighed against current theory for its reasonableness and against available experimental and observational evidence for its plausibility. (With one minor exception, no original research is reported.) The propositions appear to organize successfully a number of otherwise discrete findings. Several factors relevant to the distribution of influence are not systematically taken into account, however, and no studies designed specifically to test the set of assertions have been executed. The concepts and propositions thus combine to form a theory that is at present both incomplete and merely plausible.

In the third part of the essay, this partial theory of influence is used in two ways. First, it is held that the theory describes a process which tends continually to bring into balance the members' ranks and degrees of influence; it tends continually to produce the commonly observed correlation summarized by the statement that the higher ranking members of a group are usually also the more influential. As depicted, however, the process may actually so operate that it produces instability: it may make the difference between the higher and lower ranking members too great relative to some required degree of solidarity, or it may make the differences too little relative to some required degree of orderliness in the process of interaction. Various features of group structure are then examined in order to identify elements that may function to contain the process and to prevent it from producing instability. Second, the theory is used to explain certain things about the exercise of authority in complex organizations. Attention centers here on the status of supervisor,

defined analytically, since it is through the actions of its occupants that authority is exercised. The claim is made that the conditions under which a supervisor can exercise authority by exercising influence within his subgroup of subordinates are the opposite of those under which he can exercise authority by exercising control over that subgroup; in consequence, a given supervisor who normally exercises any authority at all in relation to his subordinates exercises for the most part either control or influence but not both.

Microfilm \$3.90; Xerox \$13.75. 303 pages.

**SOURCES OF BUREAUCRATIZATION IN GROUPS:
A STUDY IN THE THEORY
OF COMPLEX ORGANIZATIONS.**

(L. C. Card No. Mic 60-438)

Kiyoshi Ikeda, Ph.D.
Northwestern University, 1959

Chairman: Raymond W. Mack

SUMMARY

The present study codifies and organizes some important notions in the theory of complex organizations, with specific reference to the sources of bureaucratic complexity in groups. One area of concern was the implicit congruence in assertions relating group size to the development of specialized roles which are controlled through centralized and hierarchical patterns of behavior. The second area of interest related group size to diverse aspects of group behavior in a general way. A sample of the sociological literature was taken to codify and organize the hypotheses on group size and group behavior. These assertions and related evidence were codified, and a set of hypotheses about size and bureaucratic complexity were selected for empirical test.

Because of the lack of conceptual clarity, conceptual analysis was made of the construct of structural complexity or differentiation and of the concept of bureaucratization or bureaucratic complexity. Further theoretical analysis suggested that bureaucratic patterns of division of labor represent only one set among three major sets of variables which enable coordination of activities within groups. Traditional or informal organization and professional organization represent the other two patterns of structural differentiation.

Although size seemed to be a useful variable, the literature was examined systematically to determine if additional independent variables could affect the development of organizational structures. To explain seemingly inconsistent results of the predicted positive relationship between group size and bureaucratization, alternative sources of bureaucratization were identified and organized for theoretical purposes.

With due regard for these additional sources of bureaucratization, a tentative research design was constructed to test the following major hypothesis:

The larger the size of the group, the greater the extent of bureaucratization.

This major hypothesis was sub-divided into two sets of sub-hypotheses for operational or empirical test.

Because of several problems related to sampling, obtaining access into groups, and complexities in operational definitions, the lowest level of research design, with the only advantage of cross-group comparisons, was chosen.

Given the crude observational and interview measures, the findings do suggest that there is a consistent set of organizational procedures which develop to cope with organizational problems within a group. The sub-hypotheses, and consequently, the major hypothesis that size is positively associated with bureaucratic complexity is supported in the present study.

Microfilm \$3.65; Xerox \$12.85. 283 pages.

**A SOCIOLOGICAL STUDY
OF WORKERS' PARTICIPATION IN THE JOINT
CONSULTATION SCHEME OF INDIAN INDUSTRIES**

(L. C. Card No. Mic 60-473)

P. S. K. Murty, Ph.D.
Duke University, 1959

Supervisor: Alan C. Kerckhoff

This is a study in the general problem area of inter-group conflict although it is specifically concerned with industrial conflict. The purpose of this study is to examine the functions and effects on industrial conflict of workers' participation in the post-independence joint consultation scheme of Indian industries.

The antecedent of the Indian participation plan was the Whitley Scheme of England which assumed that if two-way communication were increased between management and workers through the medium of a workers' participation scheme, and if that communication were used to seek and identify their common objectives, it would promote labor-management cooperation and reduce industrial conflict. A review of the literature on industrial relations as well as other types of intergroup relations revealed adequate support for the above assumptions. In view of this, a set of three operationally meaningful hypotheses were deduced for the purpose of this study. They are:

- (1) In industrial relations, if workers' participation in joint consultation is introduced in industry, it tends to increase two-way communication between management and workers.
- (2) If the increased two-way communication is aimed at seeking and identifying common objectives of management and workers, it enables them to cooperate with one another.
- (3) If labor-management cooperation increases, industrial conflict will decrease.

In order to test these hypotheses in the Indian experience of workers' participation, the relevant political, social, and economic conditions were examined to determine their impact on labor-management cooperation and industrial conflict. The examination revealed both positive and negative effects. While the legislative action of the

government and the religious value of pacifism have the tendency of reducing conflict and promoting cooperation, the growth in labor-force accompanied by a rise in living costs and the relative growth in trade union activities has the tendency to increase industrial conflict.

It is against this background that the above hypotheses have been tested in the Indian workers' participation plan. An examination of the structure and the functions of the Indian plan revealed that workers' participation has increased two-way communication between management and workers by opening many new channels of discussion, conciliation and adjudication. These took the form of Standing Orders (explicitly stated conditions of employment), works committees, new dispute-settling machinery and several national and state institutions which bring together representatives of management, labor, and government. Thus, support was found for the first hypothesis.

Indices of productivity, profits, and real wages were examined for evidence of labor-management cooperation in those activities closest to the heart of the industrial enterprise: production and the distribution of the gains therefrom. As an index of industrial conflict, the number of man-days lost due to work stoppages was recorded. This analysis was carried out for the "participation" period (1948-56) and the "pre-participation" period (1921-47). Although there were numerous factors involved in the pattern of change in these various indices (e.g., capital investment, size of labor-force, exploitation of natural resources, etc.), there is clearly a pattern of increased productivity and rising real wages during the "participation" period whereas these indices declined or remained at a low level during the "pre-participation" period. Also, the amount of industrial conflict has generally been considerably lower during the "participation" period when size of labor-force is taken into account. These data offer support for the second and third hypotheses.

Thus, all three hypotheses have gained support from the data of the study, although the relative importance of the factors considered for the post-independence improvement in the industrial relations of India cannot be determined from the data studied here.

Microfilm \$2.50; Xerox \$8.00. 171 pages.

**SOME FUNCTIONS OF THE
ACTIVE THERAPIST ROLE:
A CONTENT ANALYSIS
OF 100 PSYCHOTHERAPY SESSIONS.**

(L. C. Card No. Mic 60-23)

Erdman B. Palmore, Ph.D.
Columbia University, 1959

This dissertation is a functional analysis of the active therapist role in the psychotherapy dyad. The psychotherapy dyad is conceived of as an equilibrium maintaining social system requiring the essential functions of integration and goal achievement. One hundred psychotherapy sessions were tape-recorded and content analyzed along with seven different types of questionnaires administered to each patient and therapist at various stages in the therapy. There were four therapists and eleven patients involved. A total of 40,275 propositions were classified along four major dimensions.

It was found that two of the therapists were consistently more active than the other two along three dimensions of activeness. The active therapists conceived of themselves as more active, they spoke more frequently and made longer statements, and they structured the therapy more than the passive therapists.

The dyads of the active therapists show less premature terminations, less broken appointments, and less patient frustrations. Thus, they seem to be more integrated. Secondly, the active therapist dyads show more goal achievement as indicated by the therapist's estimate of progress and patient change, the amount of patient value change, and the amount of change in the patient's family interactions.

Five mechanisms were identified through which the active therapist role functions to achieve this integration and goal achievement. The active therapists teach the patient his new role as a patient more actively than the passive therapists. Secondly, the active therapists are more sensitive to the patient propositions than the passive. Thirdly, the active therapist's more frequent use of structuring statements tends to reduce system strain and excessive expressive concern. Fourthly, the active therapists encourage more affective and evaluative-prescriptive discussions. Finally, the active therapists manipulate the reward system more than the passive therapists.

Therefore, it was concluded that in this type of psychotherapy the active therapist role can function to maintain integration and goal achievement more effectively than the passive therapist role.

Microfilm \$3.65; Xerox \$12.85. 282 pages.

**INTERPERSONAL RELATIONS
IN ETHNICALLY MIXED SMALL WORK GROUPS**

(L. C. Card No. Mic 59-6400)

Woodrow Wilson Scott, Ph.D.
University of Southern California, 1959

Chairman: Professor Vincent

This study was undertaken to investigate the interpersonal relations of individuals from different ethnic backgrounds in work groups of a factory. Four research hypotheses were developed for this study. (1) Antagonistic conflict attitudes toward fellow workers from different ethnic backgrounds working together under production-efficiency procedures will tend to be lessened. (2) Cooperative attitudes of individuals from different ethnic backgrounds working together under production-efficiency procedures will tend to be developed. (3) Under these conditions active friendships tend to develop. (4) The development of "balanced work groups" in which no one ethnic group has numerical advantage over the other groups tends to stimulate cooperative and friendship attitudes among the members of the work group.

Sixteen different work groups in a selected factory in southern California made available 132 workers who were interviewed in 1955-1956, utilizing a schedule which involved a conflict rating, a cooperation rating, a friendship scale, and an ethnic imbalance index. All individuals were interviewed personally. The United Auto Workers of the C.I.O. became the bargaining agent of these workers shortly

after the first series of interviews were completed. One year later a sample of 32 workers from 10 work groups were reinterviewed using the same interview schedule. The results of these interviews were compared with the previous ones and any changes that had taken place were recorded and analyzed.

Results. The introduction of the union into the factory brought new leadership roles among the workers, giving new statuses to selected workers and ethnic groups. The personnel manager and the foremen of the company changed their procedures between 1956 and 1957, placing responsibility upon the workers serving as union stewards and committeemen. The result of these two factors was an increased conflict score in certain work groups.

The larger work groups with several ethnic groups represented tended to have more cooperative relationships among workers than did the smaller work groups with limited ethnic mixture. Differences in attitudes and cultural background tended to be emphasized in the smaller work groups because of the marked primary group relationships.

It was found that employees enjoy working together with individuals from different ethnic backgrounds when they can interact and not be continuously under pressure to produce. Under such conditions friendship attitudes develop which tend to be continued outside the factory. A general re-evaluation of friendships was made among workers between 1956 and 1957 because of the split loyalty of workers to the union officials and to management.

The average conflict rating score was negatively correlated to the ethnic imbalance index because of an increased dependence upon the majority-group workers in the work group. The average cooperation rating was positively related to the ethnic imbalance index. When only one or two members of one ethnic group are associated with a large number of members of another ethnic group in work relationships, the majority-group tends to cooperate readily. The minority-group workers seek the cooperation and accept it gracefully. The development of friendship attitudes tends to have little relationship to the imbalance index. Interpersonal relations between workers tend to operate more or less independently of the number of ethnic groups present in the work group.

Conclusions. (1) Cooperation scores, conflict scores, and friendship scores serve in measuring interpersonal relations between employees in work groups. (2) The "balanced work group" concept as developed in this study proved to be a useful tool in studying the conflict, cooperative, and friendship relationships between workers in work groups. (3) Ethnically mixed work groups under benevolent attitudes of management reduce conflict attitudes, increase cooperative attitudes, and develop friendships that continue outside work group relationships.

Microfilm \$3.75; Xerox \$13.05. 290 pages.

THE MEASUREMENT OF VALUE

(L. C. Card No. Mic 60-51)

Geoffrey Howland Tootell, Ph.D.
Columbia University, 1959

Though value is one of the most strategic terms in much of social theory, its overall use in investigation has

been ambiguous, vague, and confused. The first part of this inquiry focusses upon a number of different studies concerning values. It is a critical review of the way some investigators have coordinated various conceptions of value with different kinds of conceptualizations and research procedures. In general, it seems that a judicious coordination of sophisticated conceptions and operations leads to more convincing results.

The second part of the inquiry is an attempt to combine the conclusions derived from the first part with various other ideas to form a productive sociological concept of value. It is proposed that value be treated as a dispositional concept, applicable to groups. It can be applied when groups display some of the presumed consequences of the existence of values. These include the existence of uniformities in attitude or behavior, of cohesiveness, and of effective social controls. Finally, it suggests the strategic methodological role of dispositional concepts, and the strategic substantive role of value as such a concept.

Microfilm \$5.60; Xerox \$19.80. 439 pages.

GLOVERSVILLE, NEW YORK: A COMMUNITY STUDY OF INDUSTRIAL TRANSITION AND SOCIAL CHANGE.

(L. C. Card No. Mic 59-7244)

Donald Ralph Vosburgh, D.S.S.
Syracuse University, 1958

Supervisor: Byron Fox

Gloversville, the larger of two small cities in predominantly rural Fulton County, New York, has long been the center of the American glove industry. In the early years of the present century this upstate locality produced between 80 and 90% of the nation's handwear. Since other commercial enterprises occupy places of only secondary importance, the manufacture of gloves has been carried on in what is essentially a one-industry environment.

Largely a handicraft trade, glovemaking has never lent itself to mass production methods. Special skills in the selection and processing of leather makes machine stitching almost the only completely mechanical operation. As a result, particularly in recent years, labor costs have been in inverse ratio to the demand for gloves. More liberal tariff policies have resulted in increased competition from foreign producers. Especially since World War II, the industry has experienced a growing number of economic problems. Many establishments have been forced out of business and others have moved to different parts of the country.

The present study is primarily concerned with an investigation of changes. First in considering those which have affected the glove industry and then with their effects upon the community. In order to illustrate such changes, a comparative method has been utilized. First Gloversville and the glove industry are considered in terms of their situation in 1930 at the beginning of the depression. Conditions at that time are then compared with those of more recent times (1950-1958). Data are drawn from many sources including historical materials, census tracts, business statistics, newspaper files, and personal

interviews with selected people in the community. This material is compiled for purposes of discovering those areas in which change has been most pronounced and those in which it has had relatively little effect. The general hypothesis advanced is that there has been a significant correlation between economic and/or industrial changes and changes in other selected aspects of community life.

Investigation reveals that the greatest changes in the industry have resulted from: (1) a decreasing consumer demand for gloves, (2) relatively high production costs in proportion to volume of sales, and (3) more liberal tariff policies, particularly since the Trade Agreements Act of 1934, which have resulted in a marked increase in competition from foreign producers.

Since 1930, the greatest changes in the community have been: (1) increased unemployment, (2) large numbers of workers commuting to places of work in other cities, (3) the out-migration of many younger residents upon completion of high school, and (4) feelings of insecurity or frustration which have grown out of limited success in bringing about industrial diversification to make up for losses in the glove business. The changes which the study shows to be least significant have been those affecting: (1) population and social structure, (2) over-all standard of living, (3) political preferences, and (4) marriage and family stability.

As its principal industry has declined in importance, the community which once took pride in being the "glove capital of the nation" has come to face an uncertain future. The realization of industrial diversification has been and continues to be hampered by problems of location and transportation. While attempts to promote the area's potential as a resort have been fairly successful, this is only a partial stimulant to the total economy. Time has brought many changes to Gloversville and this community has come to learn that change, while inevitable, is not necessarily synonymous with progress.

Microfilm \$3.80; Xerox \$12.80. 294 pages.

ESTIMATES OF ANNUAL BIRTHS AND BIRTH RATES FOR THE WHITE POPULATION OF THE UNITED STATES FROM 1855 TO 1934

(L. C. Card No. Mic 59-5251)

Melvin Zelnik, Ph.D.
Princeton University, 1959

A major gap in the United States demographic data is the lack of estimates of annual births and birth rates covering the 19th century and the early part of the 20th. This deficiency in the demographic statistics has prevented a close analysis of the inter-relationships among demographic, economic, social, and political factors. The availability of these estimates not only would reveal the past course of fertility in the United States, but also would allow for the testing of certain previously untestable hypotheses.

The present study is an attempt at correcting census age distributions for certain errors and at estimating the births and birth rates of the white population from 1855 through 1934. Computation of births from census enumerated populations would be a simple matter if census counts were accurate and if cohort life tables existed. The population enumerated at any given age in a census could be

projected backward to the year of birth. Unfortunately, neither of the two necessary conditions is met in the case of the United States statistics. The first step, therefore, was an adjustment of the census enumerated populations for the phenomenon of age heaping, carried through separately for each sex of the native whites. The ratio of the number of persons at an age to the average number for the ten adjacent ages was calculated for each single year of age from 5 through 85 in each of the eight censuses from 1880 to 1950. Using these ratios it was possible by successive approximation to estimate the amount of age heaping for each year of age in each of the censuses and to correct the enumerated populations.

The second major part of the work was to approximate cohort life tables and use them in conjunction with the corrected census figures to estimate annual births. Because of gaps caused by war losses among the male, only female corrected populations, and their corresponding life tables, were used. Once female births had been found, total births were calculated by the application of an assumed constant sex ratio at birth. The female cohort life tables were approximated by using a succession of decade life tables. For the period before 1900, model life tables prepared by the United Nations were employed. After 1900, decade life tables were constructed from various official female life tables, corrections being applied where necessary so that these tables represented continental United States. Adjustments were also introduced for the 1918 influenza epidemic and the fluctuating course of infant mortality.

The series of births generated, while not capable of validation, appear to represent "reasonable estimates." They reflect the effects of changing conditions, e.g., war and fluctuations in the national economy, on the trend of births. There is also a high degree of similarity between the pattern of the present estimates and those constructed by Whelpton for the period 1909-1944. The major differences in patterns can be traced to weaknesses in the assumptions concerning age heaping.

Microfilm \$2.50; Xerox \$6.80. 141 pages.

SOCIOLOGY, FAMILY

SOCIOLOGICAL ASPECTS OF HYSTERECTOMY

(L. C. Card No. Mic 60-747)

William Paul Hawkinson, Ph.D.
The Ohio State University, 1959

The central purpose of this study was to determine the social characteristics of women scheduled for and subjected to hysterectomy at the Obstetrics-Gynecology Clinic of the Ohio State University. The problems involved concerned both the family area of sociology and the field of medical practice. It was assumed that a hysterectomy, involving the removal of the woman's uterus, would have an important bearing on family relationships. Three aspects of family relationships considered were parenthood, marital satisfaction and sexual satisfaction. Also considered were possible personality disorders.

Data were obtained by means of a questionnaire

presented to four groups of clinic patients. The first group consisted of thirty-five patients scheduled for a hysterectomy. The second category included 104 patients upon whom a hysterectomy had already been performed. The third category included thirty-three patients scheduled for surgery other than a hysterectomy. The fourth category consisted of 239 patients with heterogeneous somatic complaints. These four categories, containing a total of 411 patients, constituted the sample.

Statistical analysis of the data was directed toward answering two questions. First, are women to be hysterectomized different, on the basis of selected criteria, from other women who attend the OB-GYN clinic? Second, are women who have been hysterectomized different from women who are to be hysterectomized? While the first question emphasized selectivity, the second was an attempt to determine selected background, family, and psychological concomitants of hysterectomy.

It was found that the to-be-hysterectomized women were significantly different from all other patient groups in such background characteristics as age, race, marital status, education, number of children and age of youngest child. In general, of all women who came into the clinic, the older woman who was white, had older children, and a greater number of children was more prone to be hysterectomized.

The post- and pre-hysterectomy categories did not differ significantly in age, race, marital status, education, religion, number of children, age of youngest child or occupation. They did, however, differ in their family relationships. These differences suggested that the hysterectomized women were better satisfied with their marital and sexual relationships than were the women to be hysterectomized. The only area in which the post-hysterectomy women showed poorer adjustment than the pre-hysterectomy women was on masculinity-femininity scores of the Minnesota Multiphasic Personality Inventory. Post-hysterectomy women were more masculine and were more concerned with bodily functions than were the pre-hysterectomy women. There was no evidence to indicate that the hysterectomy women suffered in their family relationships as a consequence of the hysterectomy.

Microfilm \$2.50; Xerox \$4.80. 93 pages.

INFANT TRAINING PRACTICES, FAMILY SOCIAL CLIMATES, AND PERSONALITY ADJUSTMENT.

(L. C. Card No. Mic 60-759)

Harold Neely Kerr, Ph.D.
The Ohio State University, 1959

The purposes of this dissertation were twofold: (1) to test the hypothesis that there is a significant relationship between infant training practices and personality adjustment and (2) to test the hypothesis that there is a significant relationship between family social climates and personality adjustment.

To accomplish these two purposes, the following data-gathering procedures were carried out: (1) All sixth grade pupils in six public schools in Morgantown, West Virginia, were given the California Test of Personality,

Intermediate Form. This yielded a total of 15 measures of personality adjustment or behavior indicators. (2) On the same day the pupils took the California Test of Personality they also completed a personal data form. On the basis of the personal data which the children supplied, later verified by teachers and mothers of the children, the children having sample eligibility were located. (3) The actual study sample of one hundred children was then randomly chosen from among those who qualified for the sample. (4) Five teachers were then asked to rate each sample child in terms of seven behavior indicators. (5) The final procedure for gathering data involved the interviewing of the mother of each sample child concerning the actual infant training practices and family social climates to which each child had been subjected.

The foregoing procedures yielded data whereby two general hypotheses in the null form could be tested by means of the Chi-square test.

The first hypothesis tested asserted that personality adjustments of children subjected to varying infant training practices do not differ significantly. Only 12 of the 230 Chi squares computed to test this hypothesis were large enough to be statistically significant at the .05 level.

The second hypothesis tested asserted that personality adjustments of children subjected to varying family social climates do not differ significantly. Of the 138 Chi squares computed to test this hypothesis, a total of 50 were large enough to be statistically significant at the .05 level.

Thus, on the basis of the findings of this study, the traditional psychoanalytic position with regard to infant training practices and personality adjustments must be rejected. Also, on the basis of the findings of this study, the idea that there is a significant relationship between personality adjustments and family social climates must be accepted as more tenable than the psychoanalytic hypothesis.

Microfilm \$2.50; Xerox \$5.80. 120 pages.

FAMILY ROLES IN TWO GENERATIONS

(L. C. Card No. Mic 60-372)

Vimla Swani, Ph.D.
Cornell University, 1959

The aim of the study is to investigate intergenerational changes in "equalitarianism" and "companionship" in marriage, and also to explore the association of background variables such as mobility and early personal relationships as factors in intergenerational changes. Four types of mobility have been investigated: (1) occupational, (2) educational, (3) geographical, and (4) nationality changes. The early interpersonal relationships that were explored dealt with the marital happiness of parents and parent-child relationships.

Method: Data for the study were obtained from a homogeneous sample of 110 college educated couples, drawn from heterogeneous backgrounds. The instrument was a highly structured questionnaire designed to elicit information on the same variables about the subjects' own marital relationship and that of his parents (when the subject was young). The variables on which information was sought were task differentiation, joint performance of tasks, authority differentiation, and opinions about the proper

distribution of family responsibilities. Both husband and wife answered the questionnaire independently of each other.

Results: Comparisons between the responses of the spouses concerning their present family show a consistent tendency for each spouse to claim for himself a larger share of the family responsibilities than his mate believes he holds. Furthermore, there is some evidence to suggest that this claim is made particularly for the family tasks that are not considered very pleasant to perform.

Concerning intergenerational changes, the husband-wife relationship of the present generation is more "equalitarian-companionate" than that of the parent generation. However, this greater equalitarianism is not manifested uniformly in all the variables of the marital relationship. It is most pronounced in the areas of power and decision making. In the actual performance of tasks, on the other hand, there is considerable differentiation of roles except in Leisure Time Activities.

The marital relationship in the parent generation, although less "equalitarian-companionate" than in the present generation, was not traditional in the real sense of the term. There was a considerable degree of shared responsibilities between mates in those families also. If anything, the mother was more dominant than the father.

Concerning the effects of various background factors, only occupational status was consistently related to patterns of family living. There are no significant relationships between the social status of the parental family and the pattern of family roles in the present generation.

Marital happiness of parents is related to the marital interaction of the offspring. Individuals whose parents were unhappily married are more "equalitarian-companionate" in their own marital relationships than individuals whose parents were happily married. Parent-child relationships in the parental home is, however, apparently unrelated to the marital interaction of the offspring.

Microfilm \$2.50; Xerox \$8.40. 181 pages.

SOCIOLOGY, RACE QUESTION

CIVIC DEMOCRACY IN THE SOUTH

(L. C. Card No. Mic 60-741)

Charles Goode Gomillion, Ph.D.
The Ohio State University, 1959

Civic democracy is defined as that condition of society in which the status and opportunities of citizens are not restricted because of race, color, creed, or national origin. It is assumed that the quality and prospect of civic democracy in the South can be indicated by an analysis of the status and opportunities of Negro citizens in the sixteen Southern States.

The research objectives were to analyze (1) the relation between indices of the status and opportunities of Negroes and other socio-cultural factors, (2) the direction of the trend in the Negro's status and opportunities, (3) the roles of racial and interracial groups whose members profess to believe in civic democracy, and (4) the quality

of civic democracy as shown by the ranks of the Southern States on indices of status and opportunities of their Negro citizens.

Responses of fourteen Negro leaders in civic education organizations were used in the construction of five indices of status and opportunities. The relationship between the indices of status and opportunities and selected socio-cultural factors was gauged by using Spearman's formula for rank correlation.

Selected white and Negro editors and officers of racial and interracial organizations in the South submitted information about what they or their organizations were doing to facilitate the movement toward civic democracy.

The data reveal that —

1. There is support for these hypotheses: (a) the Southern Negro's status and opportunities are greater in states having the higher percentages of their population white, urban, and employed in non-agricultural work, having the higher percentages of Negroes registered to vote, and the higher median school years completed by non-whites; and (b) civic status and opportunities are most restricted in states having the highest percentages of Negroes in the population, and gainful workers in agriculture and related occupations.

2. The trend in the socio-cultural environment has been increasingly toward greater civic opportunities for Negroes.

3. Negro editors and civic education organizations are working persistently (a) to secure more opportunities and services for Negroes and (b) to stimulate them to prepare for more effective utilization of the broadening opportunities.

4. Desegregation of public facilities and services is increasing.

5. Contributions to the development and extension of civic democracy are being made by white and Negro citizens who study and work together, and also by those white editors, "moderates," and women who plead for the maintenance of law and order and the continuance of the public schools, for respecting court decisions, and for equalization of civic opportunities, and who state publicly that civil rights take precedence over states' rights.

6. The federal government is facilitating the movement toward civic democracy through decisions of the courts, the Civil Rights Act of 1957, and presidential executive orders forbidding racial discrimination.

7. The status and opportunities of Negroes are greatest in Maryland, West Virginia, Kentucky, Delaware, and Oklahoma, and most restricted in Mississippi, Georgia, Alabama, Louisiana, and South Carolina.

The findings seem to warrant the conclusion that the trend toward civic democracy in the South will continue, but that its rate and quality will be affected by the racial composition of the population; urbanization; industrialization; the availability of educational and occupational opportunities; the work of Negro and interracial organizations; the individual efforts of white journalists, authors, "moderates," and women; and the policies and practices of the federal government in the field of civil rights.

Microfilm \$3.30; Xerox \$11.50. 255 pages.

**A TENTATIVE CRIMINAL TYPOLOGY
OF FOUR-HUNDRED NEGRO FELONS
AT THE DISTRICT OF COLUMBIA REFORMATORY,
LORTON, VIRGINIA.**

(L. C. Card No. Mic 59-2798)

Julian Baker Roebuck, Ph.D.
University of Maryland, 1958

Supervisor: Peter J. Lejins

The problem was to arrive at a criminal typology which would serve as a tool in the tentative delineation of functional, etiological types of offender groups.

Criminal typologies of the past seemed overly ambitious -- attempts to derive universally valid offender groups; but these interesting speculations have neither been supported by research findings nor have been subjected to a test of practical application.

The need seemed evident for a typology built on definite criteria with observable referents in the empirical world, in terms of a restricted population group. The definition of crime and criminals is related to time and space; hence, the concern of this project with a restricted schema -- an approach permitting concentration upon problems of limited scope with manageable relatively homogeneous behavior groups. It hinges on two considerations:

1. Presence or absence of patterns in offenders' criminal histories.
2. Association of certain social and personal background factors with certain criminal patterns.

It was hypothesized that arrest histories expressed in legal categories would exhibit a specific patterning; and that patterning would be related to certain configurations of social and personal characteristics; that individual offenders classifiable under one "criminal pattern" category would show many similarities in their social and personal characteristics. It was assumed that knowledge of these configurations of background characteristics of groups of offenders having common arrest history patterns would indicate treatment methods.

To serve this typological scheme, information was obtained on the arrest history patterns, and on social and personal characteristics for a sample of four-hundred felony offenders admitted to the D. C. Reformatory from the D. C. Jail. These were selected at random from 1115 current Negro cases. The data were gathered by means of a case history schedule focussed on two major areas: (1) forty-two characteristics, which were selected as significant factors in their relation to crime; and (2) arrests by criminal charge. The offenders' institutional folders (official dossiers) and personal interviews served as sources.

An analysis of arrest histories with regard to minimum frequency, relative frequency, and recency of charges revealed thirteen "criminal categories" (arrest history patterns):

1. Single Pattern of Robbery
2. Single Pattern of Narcotic Drug Laws
3. Single Pattern of Gambling

4. Single Pattern of Burglary
5. Single Pattern of Sex Offenses
6. Single Pattern of Embezzlement and Fraud
7. Single Pattern of Auto Theft
8. Single Pattern of Forgery and Counterfeiting
9. Triple Pattern of Drunkenness, Assault, and Larceny
10. Double Pattern of Larceny and Burglary
11. Double Pattern of Assault and Drunkenness
12. No Pattern A (fewer than three arrests)
13. No Pattern B (insufficient arrests on any one charge)

The four-hundred cases were assigned to these categories. The characteristics were tabulated in a frequency table for each of these categories. Six categories which had an insufficient number of cases for statistical analysis were treated qualitatively. The other seven were compared with the rest of the sample on those characteristics which discriminated among categories. Differences between relative frequencies were tested by means of the chi square technique. This operation brought out two fairly homogeneous clusters of arrest patterns: one cluster of four patterns, and one of three. A more refined analysis by internal comparisons within these two clusters was made with the chi square statistic. In short, delineations were made between arrest pattern categories which seemed similar when viewed in the context of the total sample.

The results of the chi square tests of significances were exhibited in profile tables sectioned for the seven criminal categories and the social and personal characteristics.

Finally, each of the thirteen categories was described as a social type (social background and personality type) on the basis of the material obtained through the statistical analysis as well as from the appropriate information of a qualitative nature. These social types represent the writer's typology.

Microfilm \$5.65; Xerox \$20.05. 443 pages.

**SOCIOLOGY, SOCIALISM, COMMUNISM,
ANARCHISM**

**POLITICAL YOUTH ORGANIZATIONS
IN EUROPE, 1900-1950:
A COMPARATIVE STUDY OF SIX RADICAL PARTIES
AND THEIR YOUTH AUXILIARIES.**

(L. C. Card No. Mic 60-34)

Eric Josephson, Ph.D.
Columbia University, 1959

The emergence of political youth organizations in Europe accompanied the growth of mass parties on left and right aiming for more than routine change in the social

order. The relative isolation of these class parties from the "respectable" political community forced them to rely on their own inner resources, to build massive membership structures, and to undertake the systematic and continual recruitment and indoctrination of young people in order to replenish their human resources, groom future leaders, and provide direct assistance in the struggle for power and in effecting social change. The more fundamental the change and the greater the role of the party itself in directly organizing masses and shaping opinion to carry out that change, the more significant the part played by the youth auxiliary.

The ordinary function of these auxiliaries is to serve as recruitment agencies, or to attract young voters. But radical parties, facing serious opposition from older generations, or making heavy demands on adult members, are likely to begin the process of political education at an early age and to carefully control the training and selection of new recruits. A less common function of these organizations, especially in revolutionary situations, is to serve as "shock forces" in war, or in mass drives for economic reconstruction.

The internal structure of political youth movements varies widely, depending on the extent of age and sex differentiation within their ranks, on their assigned functions, and on their relationship to the adult party. Although differing in the freedom of expression they grant to youth, authoritarian and democratic parties alike have insisted on the subordination of junior auxiliaries to the adult apparatus and have frustrated youthful participation in decision-making. Imposition of adult authority and insistence upon discipline frequently lead to conflict between young and old.

Politics is an adult domain, however, and most young people are more interested in their personal adjustment to adult life than in affairs of state. As a result, their participation in party activities can be non-political; and, especially for those in their 'teens, opportunities for comradeship and sports within the ranks of the youth auxiliary can have greater appeal than the party's official program, or than politics in the adult sense. But the relatively few youth who do become politically motivated often become impatient with cautious adult tactics. Youthful radicalism or impetuosity is still another source of tension between age groups in politics. Youth auxiliaries are controlled by adults, but unless they are regimented along military lines, or satisfied in their desire for bold action, youthful dissatisfaction may become explosive.

Case studies show that the Social Democratic Parties of Austria and Germany, among the first to organize youth separately and to develop a rich cultural life for them, ultimately lost the support of many young people (particularly in Germany) because of pronounced gerontocratic tendencies and an inability to resolve conflict between revolutionary slogans and reformist practice. The British Labour Party, least systematic of all Socialist movements in the recruitment and indoctrination of adherents, has persistently failed to get its youth auxiliary off the ground, largely because the party has been unwilling to tolerate the expression of unorthodox views and has repeatedly crushed its youth organization. The Italian and German Fascist movements achieved power partly because of their great appeal to youthful idealism, and then proceeded to build the most complex apparatuses yet known for regimenting vast numbers of youth and preparing them for imperialist war.

There is no denying the power of Fascist youth organizations, but that power was used primarily for destructive ends. The decline of the Fascist parties themselves as direct agents of change after they had gained power was still another element in their essential failure to mobilize youth for constructive goals. On the other hand, the Soviet regime has gone farthest of all European radical movements in putting youth to work on major tasks of social reconstruction and in drawing upon a junior auxiliary to help sustain the life energies of the ruling party.

Whether democratic movements can release the latent power of youth still remains to be seen. In this respect authoritarian parties in power have obvious advantages. The movements that have been most successful in motivating and mobilizing youth have created visible opportunities for young people to make a contribution, however limited, to policies of constructive change; have established fairly effective procedures for graduating youth into the adult organization; and have developed activities which appeal strongly to the young. In the final analysis, it is desperate reactions to critical situations that have created the greatest opportunities for youthful participation in politics. In Western Europe today there is less mass involvement in politics than in the critical inter-war period; and it is possible that political youth movements there will decline in importance. On the other hand, they may play a significant role in underdeveloped countries that are committed to radical change in the social order and are determined to harness all human resources to achieve their goals.

Microfilm \$4.30; Xerox \$15.10. 335 pages.

A POLISH FACTORY: A CASE STUDY IN WORKERS' PARTICIPATION IN DECISIONS IN INDUSTRY.

(L. C. Card No. Mic 60-621)

Jiri Thomas Kolaja, Ph.D.
Cornell University, 1959

According to Karl Marx, and other Communist theoreticians, the conflict between management and workers in an industrial enterprise would disappear once a factory becomes nationalized. On the basis of a field study undertaken in a Polish textile factory in Summer, 1957, it appears that the Marxist theory cannot stand the test of the empirical evidence. It has been found that antagonism between both major groups of a production organization has not disappeared in the factory studied.

After Gomulka's return to power in 1956, there was added to the three existing organizations operating within the factory (the management, the Party, and the labor union) one more, called the workers' council. The purpose of the latter was to provide for workers' participation in management, and through it to increase production. Since the workers' council did not meet expectations, both of the management as well as the workers, the problem was to find out why the new organization did not succeed.

For two months the author was free to interview both workers as well as management. He attended production meetings organized by the workers' council. In addition, he administered short questionnaires and schedules to a group of twenty-four workers. Furthermore, he collected

data on their interaction pattern at work, obtaining also their production and earnings data from the management. Thus his data are composed of a direct observation of events as well as of attitudinal data. Both categories of the data converge and support the conclusion.

The workers did not participate in discussions at meetings primarily because they did not feel they had any organization of their own. From the viewpoint of the workers, the management, the Party, the labor union, and increasingly the workers' council were representing the same interest, i. e., the management. The evidence has been presented that the management sought to use the new workers' council as another channel by means of which it could control the workers. The workers differentiated strongly between "them," i. e., the management and other leading personnel, and themselves, i. e., "workers." The result of management's actions was workers' or foremen's silence and a lack of response at production meetings, organized by the management, by the workers' council.

Thus the management's drive for the control of workers and simultaneously a manifested effort to induce them to participate in meetings were contradictory and ambiguous goals resulting in dysfunctional effects. Occasionally the workers were able to initiate actions of their own, especially in personal emergencies. Characteristically, such actions tended to run outside the existing organizations.

Basically, the problem of workers' participation rested in the inadequate assumptions of the Marxist theory. As the institutions and organizations studied are to some degree led by the theory, this creates tensions and ambiguity on the behavioral level. It seems that a remedy would be to institutionalize the antagonistic relationship between the workers and the management, permitting so for a more open and equal communication between both groups. Thus not the ownership as such, but rather provisions for two-way communication seems to be the most important factor in workers' possible participation in management.

Microfilm \$4.15; Xerox \$14.65. 323 pages.

SPEECH-THEATER

**A STUDY OF THE POLITICAL DEBATE BETWEEN
DWIGHT D. EISENHOWER AND ADLAI E. STEVENSON
IN THE PRESIDENTIAL CAMPAIGN OF 1956.**

(L. C. Card No. Mic 60-420)

Otto Frank Bauer, Ph.D.
Northwestern University, 1959

Supervisor: Glen E. Mills

The objective of this study is to test the widely-publicized charge that the candidates did not debate in the 1956 presidential campaign. In order to determine whether the above charge is justified, the campaign is examined as a political debate, in which each candidate's use of the principles of argumentation and debate is observed and analyzed. Special attention is devoted to the public relations man, whose role in political campaigns has been increasing sharply.

The study is divided into two parts: the first one includes a presentation of background materials and an analysis of the campaign as a specimen of political debate; the second one includes a detailed consideration of the logical and non-logical factors in the campaign. The background chapters consist of biographical materials on each candidate and a consideration of the nature and function of presidential campaigning. The last chapter, which analyzes the campaign as a specimen of political debate, derives much of its information from the relatively long and detailed appendixes in Part Two. Each appendix dealing with the logical aspects of the campaign offers a close examination of each candidate's use of analysis and case, evidence and reasoning, and refutation and rebuttal. The remaining appendixes offer an analysis of the non-logical aspects of the campaign, a chronological presentation of the candidates' lives, and a presentation of personal interviews with Adlai Stevenson and James Hagerty.

The materials subjected to analysis are all of the nominees' speeches, news conferences, and written statements that were reasonably available and applicable to the campaign, starting with the acceptance speeches and ending with the election. Each reference that a candidate made to seven major "talking-points" was aligned in chronological order, making it possible to examine closely the use of analysis, evidence, reasoning, and refutation. Following this, the attempts of public relations men to merchandise politics is reported and analyzed.

One of the conclusions reached in the study is that compared to previous presidential campaigns the 1956 political campaign contains a significant amount of interesting and effective debate. There are many shortcomings of evidence and refutation for which both candidates must share the blame; however, the shortcomings are not sufficient to justify the charge that virtually no debating took place. The attempt of public relations men to subvert public debate of issues is a development that bears close examination in future campaigns if sound political debating is to survive. Microfilm \$4.45; Xerox \$15.55. 345 pages.

**AN EXPERIMENTAL INVESTIGATION OF THE
EFFECTIVENESS OF BINAURAL HEARING
FOR ADULTS WITH HEARING IMPAIRMENTS**

(L. C. Card No. Mic 58-7209)

William J. Brown, Ph.D.
Syracuse University, 1958

Supervisor: Louis M. Di Carlo

This investigation was designed to compare the efficiency of binaural, pseudo-binaural, and monaural

amplification for hearing impaired adults in four experimental conditions: Speech Reception Thresholds, Discrimination Scores; Speech to Noise Ratios, and Localization.

Three experimental groups of twenty subjects each were selected according to otological diagnosis of conductive, mixed, or neural deafness. Twenty normal hearing individuals served as controls in part of the experiment.

The research was conducted in two sound field rooms, each having instrumentation for the attenuation of recorded speech and noise. In one room there was a single speech source for the evaluation of Speech Reception Thresholds and Discrimination Scores. In the test area of the second room four pairs of speakers (speech and noise) were separated by 90 degrees to provide different azimuth sources for Speech to Noise Ratio and Localization testing. The experimental groups using binaural, pseudo-binaural, and monaural amplification participated in the four parts of the experiment. The control group (unaided) was evaluated for the Speech to Noise Ratios and Localization.

Recorded speech materials included six randomized lists of spondee words and four lists of the Harvard Phonetically Balanced words. Questionnaires for case history, pre-test evaluation of personal adjustment to amplification, and post-test evaluation of binaural and pseudo-binaural listening were devised for the experimental subjects.

Results

Preliminary audiometric testing determined the mean group air tone thresholds of audibility to be 47.63 decibels for conductive, 54.28 for mixed, and 53.46 decibels for the neural group. Bone thresholds were 8.46 for conductive, 28.50 for mixed, and 45.90 for the neural group. Very high correlations were revealed between air tone thresholds of audibility and Speech Reception Thresholds but low or negative correlations were found between the air thresholds and Discrimination Scores.

The Speech Reception Threshold testing disclosed a binaural summation (comparison of binaural with better monaural threshold) of 3.90 for the conductive group, 3.40 for the mixed, and 2.40 for those having neural loss. The greatest difference in thresholds for binaural, pseudo-binaural, and monaural amplification was in the conductive group where the binaural was lower (better) than the pseudo-binaural threshold by 5.8 decibels.

Discrimination Scores were not significantly different for the three types of amplification for any of the groups when the better monaural score was compared with the binaural and pseudo-binaural scores. There was a significant difference for all groups between the better and poorer monaural scores.

For Speech to Noise Ratios the spondees were presented at 70 decibels and the resultant score was the level at which white noise masked out the speech. The poorest performance occurred for all conditions when the noise and speech sources were together. Binaural, pseudo-binaural, and monaural amplification produced little difference in Speech to Noise Ratios. Under all directional listening conditions the control group was superior to the experimental groups for Speech to Noise Ratios.

For the localization of noise, binaural amplification was best, monaural was second, and pseudo-binaural was poorest. Better performance was reflected when the head of the subject was not fixed than when stabilized. The control group was superior in localization to any of the experimental groups when using binaural amplification.

The pre-test questionnaire reflected greater adjustment problems for the neural group, especially in the discrimination of speech. The post-test questionnaire indicated a preference for monaural amplification over either binaural or pseudo-binaural.

Certain results indicate a need for further research concerning binaural amplification for hearing impaired people. Microfilm \$2.60; Xerox \$9.00. 198 pages.

ATTITUDES TOWARD PLAYGOING IN A SELECTED CONTEMPORARY EDUCATIONAL THEATRE AUDIENCE

(L. C. Card No. Mic 60-732)

Nathaniel Sisson Eek, Ph.D.
The Ohio State University, 1959

Interest in the educational theatre audience has increased with the rise of the educational theatre as a cultural force in the United States. This study was an attempt to determine what factors influenced the contemporary educational theatre audience in its attendance, and how these factors were related to the audience.

Two methods were tested to find these basic factors, or correlates. The direct method utilized a questionnaire; the indirect method, a variation of Murray's Thematic Apperception Test. Results of the pre-test showed that both methods yielded consistent but different correlates. The questionnaire produced a higher usable total of correlates.

The questionnaire was applied to a population of two hundred students and non-students, attenders and non-attenders. One hundred correlates were found, ranging in meaning from extreme approval to extreme disapproval.

These correlates were placed in a measuring instrument which utilized a nominating technique to determine those items which discriminated most between groups. Fifty-nine correlates proved discriminating between one or more groups at the .05 per cent level of confidence or greater.

Lastly, a forced-choice test utilizing these discriminating statements was created to distinguish between student attenders and student non-attenders. Twenty-one student discriminating statements were matched with twenty-one equal appearing but non-discriminating statements to create this test.

Results of the test showed that such a measuring instrument could discriminate between student attenders as groups and student non-attenders as groups at the .05 per cent level of confidence. Under item analysis fifteen of the twenty-one items were found to have a significant r value at the .005 per cent level of confidence. The attenders selected fourteen discriminating items more than 50 per cent of the time, while the non-attenders selected seventeen non-discriminating items more than 50 per cent of the time.

Conclusions drawn from the study:

1. The student found the literary, intellectual, and cultural appeals of the educational theatre stronger than did the non-student. The student tended to be more critical, and was more extreme in his approval or disapproval of the items.

2. The non-student found the personal pleasure appeals of the educational theatre stronger than did the

student--appeals such as seeing his friends, relaxing, and enjoying theatre for its own sake.

3. The educational theatre attender was primarily theatre oriented. He enjoyed theatre for its own sake, was inclined to see plays rather than just one specific play, felt that people of his own background and interests attended, considered attendance a pleasant and relaxing experience, and felt that the plays were well presented.

4. The educational theatre non-attender seconded this approval but to a much lesser degree. An element of prestige seemed to influence his reaction. He was primarily indifferent to attendance rather than strongly opposed.

5. The forced-choice test showed the possibility of developing an instrument for predicting group differences between educational theatre attenders and non-attenders.

Microfilm \$2.50; Xerox \$8.60. 186 pages.

AN INVESTIGATION OF THE SPEECH
AND ORAL LANGUAGE PERFORMANCE
OF NON-INSTITUTIONALIZED ACHIEVING AND
NON-ACHIEVING MENTALLY RETARDED CHILDREN

(L. C. Card No. Mic 58-7222)

Joan Jacobson, Ph.D.
Syracuse University, 1958

Supervisor: Louis M. Di Carlo

The purpose of this study was the investigation of auditory and visual skills, oral and peripheral structure and function, muscular control for speech, articulatory proficiency, and oral language of achieving and non-achieving mentally retarded children. The intelligence quotients of the 100 subjects ranged from 60 to 75 on the Standard Binet Intelligence Scale Form L. An achiever was defined as a child whose educational age obtained on the Metropolitan Achievement Test was at least equivalent to his mental age while a non-achiever was defined as a child whose educational age was at least one year below his mental age.

Five tests evaluated auditory abilities: auditory recognition, auditory retention span, following directions, following a paragraph, and following a story. Testing for visual skills included matching picture with picture, letter with letter, number with number, word with picture, sentence with sentence, and a single word with a word in sentences. Deviations in structure and function of occlusion, tongue, teeth, and velum were scored on a 5-point continuum. Muscular control for speech was tested by ten tasks involving coordinated movements of the articulators. Tests of sensorimotor involvement consisted of articulations of lips, tongue, palate, and complex articulatory coordinations. Consonants, vowels, diphthongs, and blends were tested with a picture articulation test. Stimulation was provided in isolation, nonsense syllables, and words. Deviations were classified as omissions, substitutions, and distortions. Reactions to stimulability were recorded and categorized. Fifty spontaneous utterances were obtained for each subject for the purpose of evaluating oral language.

Results

1. Performance on auditory skills did not differentiate achievers from non-achievers.
2. In matching a word with the word in sentences, the most complex visual task, non-achievers used more time than achievers at the .05 level of confidence.
3. These tests of the structure and function of the articulatory mechanism did not differentiate achievers from non-achievers: oral-peripheral structure and function; muscular control for speech; lips, tongue, palate, and complex coordinations.
4. There were no differences between achievers and non-achievers on number of correct articulations; neither were correct articulations correlated with chronological age with the exception of the medial consonant position for achievers where it was significant at the .05 level.
5. Errors made in the articulation test differentiated achievers from non-achievers. Non-achievers omitted and substituted sounds more frequently than achievers, while achievers distorted more sounds than non-achievers at the .01 level.
6. Comparing stimulation on consonants for achievers and non-achievers showed non-achievers corrected the sounds more often than achievers at the .01 level while achievers corrected sounds more often than non-achievers in isolation and nonsense syllables but not in words.
7. A comparison of achievers and non-achievers with normal subjects in mean length of response and percent of total elaborated sentences indicated that the non-achievers were a year and a half more retarded than achievers on the same scales.
8. Achievers used more nouns than non-achievers while the non-achievers used more verbs. The differences between these groups were significant at the .05 level. Both groups fell below 3-year-old normal subjects in the use of adjectives and adverbs.
9. Non-achievers used more colloquialisms-slang and made more word approximations at the .01 level.
10. Mean length of response and total elaborated sentences were significantly correlated with chronological age and mental age for achievers and non-achievers.

The language and speech findings of this investigation suggest a reappraisal and reevaluation of present instructional methods, a revised curriculum which would evolve about a language framework rather than speech skills. This curricula should introduce variations of language and auditory stimulation based on the child's own perception of his needs rather than elementalistic drill procedures.

Microfilm \$2.50; Xerox \$6.80. 144 pages.

THE EFFECTS OF STUTTERING ON AUDIENCE LISTENING COMPREHENSION

(L. C. Card No. Mic 59-6243)

Herbert Nathan Klinger, Ph.D.
New York University, 1959

The purpose of this study was threefold: (1) to determine whether stuttering interferes with audience listening comprehension, (2) to determine whether different severities of stuttering have any effect on audience listening comprehension, and (3) to determine whether prior knowledge concerning the stutterer's speech has any effect on audience listening comprehension. The population used in this study consisted of ninety-six persons. One-half of the population was drawn from students enrolled in Hofstra College. The remaining half of the population was drawn from students enrolled in Pace College. The two schools were equally represented in all groups and subgroups.

Two groupings were used in this study. The subjects were divided into three groups which were referred to as Groups A, B, and C. Each group was subdivided into two subgroups which were referred to as Subgroups A₁, A₂, B₁, B₂, C₁, and C₂. The groups, and subgroups, were similar in college grade, and were equated in sex, age, and listening comprehension.

The passages of Form 1A of the Sequential Tests of Educational Progress Listening Test were prerecorded by a normal speaker. The test was administered to the members of Groups A, B, and C, from Hofstra College, and at a later date to the respective groups from Pace College. The experimenter administered the directions, and asked the test questions in person.

Two days after each of the groups received Form 1A they were given Form 1B, an equated form of the first test. The passages in this test were prerecorded by a person who was diagnosed as a stutterer. This speaker recorded the test passages three times. In one recording the speaker spoke in what was considered to be normal speech. In the second recording the speaker spoke at one level of severity of stuttering. In the third recording he spoke at a level of stuttering which was considered to be more severe than in the second recording. Four judges rated the stuttering severities along a ten point scale which ranged from zero to nine. Zero denoted absence of stuttering, while nine denoted severe stuttering. The judges' mean numerical evaluations rated the milder stuttering at 4.25. The more severe form was rated at 6.73. The differences between these means was significant at the one per cent level of confidence.

Certain information was given to some of the subgroups prior to the administration of the second listening test. Subgroups A₁, B₁, and C₁ were told nothing concerning the speech of the second speaker. Subgroups A₂, B₂, and C₂ were informed, in writing, that the second speaker was a stutterer who was undergoing speech therapy and who had developed a healthy mental attitude toward his speech. Group A heard the stutterer use normal speech. Group B heard him use the milder form of stuttering, while Group C heard the more severe stuttering.

Analysis of variance was used to treat the data. No significant differences were revealed among the groups on both test administrations. Similarly, no differences were found to exist among the subgroups.

The results led to the conclusions that, with respect to

the levels of severity of stuttering employed in this study, (1) stuttering does not interfere with audience listening comprehension, (2) different severities of stuttering have no effect on audience listening comprehension, and (3) prior knowledge concerning the stutterer's speech has no effect on audience listening comprehension. The present findings tend to lend added strength to the argument that, so far as audience listening comprehension is concerned, stutterers should not fear increasing their verbal output.

Microfilm \$2.50; Xerox \$4.60. 88 pages.

DEVELOPMENT OF THE CONCEPT OF PUBLIC INTEREST AS IT APPLIES TO RADIO AND TELEVISION PROGRAMMING

(L. C. Card No. Mic 60-771)

Jane Noel Magruder, Ph.D.
The Ohio State University, 1959

Because of the importance of radio and television as a source of information, the courts have held that broadcasting is included in the term press, and is guaranteed freedom from government censorship. There is, however, a limitation inherent in broadcasting that does not apply to other mass media. While in theory any person may publish a newspaper, the available frequencies on which to broadcast are limited. Since these facilities belong to the people, Congress has created an independent commission to regulate broadcasting in the "public convenience, interest, or necessity." The manner in which the Federal Communications Commission and its predecessor, the Federal Radio Commission, have applied the concept of public interest to the regulation of radio and television programming is a matter of concern to society.

The Commission has interpreted the public interest primarily through its licensing activities. To study the development of public interest, it is necessary to examine the Commission's decisions in specific cases. The Commission has also expressed its views through memorandums, statements to the press, and in other ways.

Investigation of "programming in the public interest" has followed five main lines of inquiry: (1) tracing the historical development of the concept of public interest; (2) examining licensing criteria established by the Federal Communications Commission; (3) studying the manner in which the Commission has related public interest to general program content, news, discussion, political broadcasting, and advertising practices; (4) evaluating the extent to which the Commission has attempted to enforce its views toward programming; and (5) indicating reasons why the Commission has followed particular enforcement policies.

The Commission has established two kinds of program standards. One group of standards is designed to prevent the use of program materials prohibited by law or almost universally condemned by public opinion. In this category of materials are obscene, indecent, or profane language; lotteries or information concerning lotteries; and false or fraudulent advertising. A second group of standards is concerned with less concrete program factors: the promotion of balanced programming, prevention of overcommercialization, and the like.

The Commission has not been consistent in its efforts

to enforce these program standards. Stations have nearly always been "punished" for broadcasting materials prohibited by law or public opinion. Where interpretation of public interest has been involved, the Commission has made only sporadic attempts to put its views into effect.

Four basic reasons may be suggested to explain this situation: (1) changes in the philosophy of the membership of the commission, (2) the existence of more pressing problems than enforcing program standards, (3) the lack of information available to the Commission, and (4) the economic situation in broadcasting. The Commission has been unable, and presumably will continue indefinitely to be unable, to apply rigid standards of public interest to programming. In reality, the development of the concept of public interest as it applies to the regulation of radio and television programming has been largely a matter of statements of policy--not given actual enforcement.

Microfilm \$4.35; Xerox \$15.30. 337 pages.

FEDERAL REGULATION OF THE RADIO
AND TELEVISION BROADCAST INDUSTRY
IN THE UNITED STATES, 1927-1959,
WITH SPECIAL REFERENCE TO THE
ESTABLISHMENT AND OPERATION OF WORKABLE
ADMINISTRATIVE STANDARDS.

(L. C. Card No. Mic 60-769)

Robert Sears McMahon, Ph.D.
The Ohio State University, 1959

Early in the history of broadcasting, industry and Government agreed there was a vital need for the regulation of the licensing and operation of broadcast stations. Therefore, in 1927, Congress created the Federal Radio Commission to assign frequencies to stations and to regulate broadcasting. In 1934 Congress replaced the Federal Radio Commission with the more comprehensive Federal Communications Commission in order to establish an agency to regulate all forms of communications. Thus, both of these bodies obtained their power and authority from the legislative branch of the government.

Our problem was (1) to understand the intent of Congress in regard to the passage of its broadcast legislation and (2) to assess the degree of success the Federal Communications Commission has had in carrying out the purposes for which it was established -- to regulate the licensing and operation of broadcasting stations in the "public interest, convenience, and necessity," the broad standard for the licensing of stations that the Act provides.

For this determination, it was necessary to trace the development of broadcast regulation in Congress, i.e., its legislative history. Much of the dissertation deals with this aspect of the study. An effort was then made to examine the operations of the Commission, in particular those which concern the establishment and operation of workable administrative standards, and to ascertain whether the Commission has been able to establish firm, dependable policies to carry out its mandate. Particular attention was paid to the licensing of television stations since in recent years the socioeconomic impact of the licensing and transfers of TV channels has created distressing problems of administration.

An analysis of the preceding problem led to the following major conclusions:

1) By the Communications Act of 1934, the Commission was vested with broad discretionary powers.

2) When Congress vested the Commission with such broad powers, it expected that the Commission would utilize those powers to develop its own adequate licensing standards.

3) Up to the present time, the Commission has failed to establish in licensing cases definite standards upon which the nation and the industry can rely.

4) Since the Commission has been unable to formulate consistent standards and policies on its own, Congress should provide further guides looking toward their formulation.

In the final pages of the dissertation, specific proposals were advanced for consideration by Congress, and rules and regulations were suggested for adoption by the Commission. Microfilm \$4.70; Xerox \$16.65. 366 pages.

AN ANALYSIS OF PHONETIC ERRORS
IN IDENTIFYING SPOKEN SYLLABLES

(L. C. Card No. Mic 60-781)

Alan Cheshire Nichols, Ph.D.
The Ohio State University, 1959

Errors in identifying spoken words may be attributed to confusions of phonemes. The present study was undertaken to develop a method of analyzing the phonetic errors made by normal-hearing listeners in noise. The analysis involved identifying the phonetic characteristics, i.e., voicing, nasal emission, etc., of the sound spoken which were present also in the sounds that were mistakenly substituted for it.

The procedures of the present study are listed:

1. Writing the syllables to be used as stimuli. The stimuli were consonant-vowel-consonant, consonant-vowel, vowel-consonant, and vowel syllables. Nine consonants, /b, m, θ, v, z, t, , r, k/, and the omission of a consonant from the consonant-vowel-consonant syllable pattern were used in writing the stimulus syllables.

2. A male speaker with normal voice and articulation recorded the syllables on a magnetic tape recorder-reproducer. The intensity of the syllables was monitored on the VU meter of the recorder.

3. The recorded syllables were presented to 24 normal-hearing listeners, who were familiar with phonetic symbols. After a period of training, the listeners heard the experimental stimuli through headsets and transcribed the syllables in phonetic symbols. Listening was in noise in the experimental sessions.

4. The listeners' transcriptions of the initial and final consonants were tallied according to which response was made to which stimulus. This tally was made in the form of a confusion matrix, a stimulus-response matrix in which the stimuli formed the rows, and the responses, the columns.

5. For the purposes of the analysis, the responses made in error to a given stimulus were divided into a series of classes on the basis of their phonetic characteristics.

The classes were termed phonetic categories. Some of these were (a) Labial (sounds involving the lips in articulation), (b) Not-labial (sounds not involving the lips in articulation), (c) Voiced, (d) Not-voiced, (e) Nasal, (f) Not-nasal. Thus, the incorrect identifications were described in terms of phonetic characteristics.

6. The data were analyzed to determine (a) whether the phonetic characteristics of responses were reliable, (b) which phonetic characteristics of the stimulus consonants were heard in noise when the identification of the sound was not correctly made, and (c) which of the phonetic categories was most efficient in the prediction of the phonetic characteristics which listeners heard in noise.

The results of the experiment indicated that (1) the responses made by listeners were reliable, (2) the Voiced, Not-voiced, Nasal, Not-nasal, and Plosive characteristics of the consonants were most resistant to noise interference, (3) the Continuant, Anterior lingual, and Not-labial characteristics of the consonants were least resistant to noise interference.

Microfilm \$2.50; Xerox \$6.00. 125 pages.

MASKING BY NARROW BANDS OF NOISE IN VARIOUS TYPES OF HEARING LOSS

(L. C. Card No. Mic 60-450)

John Lawrence Peterson, Ph.D.
Northwestern University, 1959

Adviser: Dr. James Jerger

Prior investigations on normal ears have shown that the masking of sinusoids by broad-band white noise is explained by the critical band concept. Similar experiments on pathological ears are not consistent for specific etiological groups. Studies of masking by narrow bands of white noise on normal ears have shown a spread to frequencies below the bands of noise. Similar studies on pathological ears have illustrated that masking occurs for frequencies above and below the band of noise for sensori-neural losses but not for conductives.

Experimental Design

This study investigated masking produced by three octave bands of white noise (400-800 cps, 1200-2400 cps, and 3200-6400 cps) at effective levels of 10 and 30 db. The masked signals were 11 sinusoids at octave intervals from 125 to 8000 cps, including frequencies of 750, 1500, 3000, and 6000 cps. A group of 10 normal-hearing subjects served as controls. Three pathological groups were composed of 10 individuals each with medically-diagnosed hearing losses of presbycusis, otosclerosis, and otitis media.

The experimental apparatus generated pure-tone and white-noise signals. A switching network delivered the pure tone separately or in combination with the noise. The pure tone was periodically pulsed by an electronic timing circuit. The noise signal was presented as a continuous stimulus. The circuitry allowed both signals to be attenuated separately by the examiner. The psychophysical method of adjustment required the subject to attenuate the test signal independently of the examiner.

Subsequent to the pure-tone screening test given the normal subjects and threshold audiograms obtained for each subject in the pathological groups, a practice run in quiet using the experimental apparatus was obtained for each subject. Thresholds in quiet were then obtained for 500, 2000, and 4000 cps which were the test frequencies nearest the center of the noise bands used. Seven randomized experimental test runs were then conducted on one ear of each subject to obtain threshold measurements in quiet and at two effective levels in three octave bands of white noise.

Results and Discussion

The results show that masking is equivalent for the Normal, Otosclerosis, and Otitis Media Groups within each noise band at both effective levels. Results for the Presbycusis Group are comparable for each noise band at the 10 db level, but show more masking at the 30 db level both above and below the band when thresholds are obtained in the presence of the low and middle bands of noise. Masking for the Presbycusis Group did not differ from the other groups at either effective level in the presence of the high band.

It is hypothesized that the spread of masking observed in the Presbycusis Group is related to abnormal non-linear distortion for frequencies above the bands of noise and that detection of the envelope of the noise signal is responsible for masking below the bands of noise. This spread of masking is probably related to cochlear pathology which was not present in the other three groups. These results are apparently related to the frequency of the noise bands since a similar spread was not observed for this group when tested in the presence of the 3200-6400 cps band. It would appear that a different mechanism was operating to produce the masking for the two lower bands than was in effect in the presence of the high band.

Microfilm \$2.50; Xerox \$7.00. 147 pages.

A STUDY OF THE ARTICULATION ABILITY OF ONE HUNDRED AND TWO EDUCABLE CEREBRAL PALSIED ADULTS AND THE RELATIONSHIP BETWEEN ARTICULATION ABILITY AND SELECTED FACTORS

(L. C. Card No. Mic 60-453)

Laurel L. Schendel, Ph.D.
Northwestern University, 1959

This study was designed to investigate a representative group of educable cerebral palsied adults for the purpose of describing their articulation ability and of determining the relationship between articulation ability and such factors as age, sex, intelligence, type of cerebral palsy, presence or absence of seizures, and motor skill. Articulation ability is described with reference to single consonantal elements and to two-consonant blends. The relative accuracy of production of consonants in the initial, medial, and final positions in words, of consonants grouped according to a physiological classification, and of the voiced consonants and their voiceless cognates is presented. The type and frequency of articulation errors in consonantal elements is given.

One hundred and two educable cerebral palsied adults between the ages of eighteen and forty years served as subjects. The data were gathered by administering tests of articulation ability, mental ability, auditory acuity, and motor skill; and by obtaining information on oral language development, medical history, educational history, socioeconomic background, and therapy history. Detailed information concerning source of subjects, type of cerebral palsy, intelligence, age and sex distributions, auditory acuity, language development, method of ambulation, history of seizures, educational history, therapy experience, and socioeconomic status is presented.

The level of articulation skill of the adults was about equal to that of normal three year old children. There were also qualitative aspects of articulation proficiency which showed a pattern similar to that of young normal children. Consonants in the initial and medial positions in words were produced significantly more accurately than consonants in the final position. Consonantal proficiency was significantly higher for the "lip," "back-of-tongue," and "tongue-tip simple" consonants than for the "tongue-tip complex" consonants, and significantly higher for the "lip" than for the "back-of-tongue" consonants. Accuracy for the final voiced consonants was significantly less than that for the final voiceless consonants. Consonantal blends were more difficult to produce than single consonantal elements.

Accuracy of production of consonants did not improve with age, and the differences in consonantal proficiency between the male and female subjects and between the seizure and nonseizure groups were not statistically significant. Articulation ability did appear to be related to intelligence.

Substitution errors occurred almost twice as frequently as omissions. The group of adults exhibited strong tendencies to use as substitutions those consonants which had been classified in the same physiological category as the consonants which were being tested.

The spastics were more accurate than the athetoids in the production of consonants in the initial and final positions in words but there was no difference between these two groups for consonants in the medial position in words. The spastics made fewer omissions than did the athetoids for consonants in each of the three positions in words and made fewer substitutions for consonants occurring in the initial position in words. The spastics were more accurate in producing consonantal blends than were the athetoids.

Motor efficiency of the speech mechanism appeared to be closely related to accuracy of production of consonants. Speech proficiency appeared to be more closely related to motor skills involving the lower extremities. Proficiency in the use of the speech mechanism was similar to that of normal three- and four-year-old children. There appeared to be a considerable degree of relationship between motor efficiency of parts of the speech mechanism and other parts of the body.

Microfilm \$2.95; Xerox \$10.15. 225 pages.

A STUDY OF THE EFFECTS OF DELAYED SIDE-TONE ON FOUR ASPECTS OF STUTTERERS' SPEECH DURING ORAL READING AND SPONTANEOUS SPEECH

(L. C. Card No. Mic 60-796)

George Arnold Soderberg, Ph.D.
The Ohio State University, 1959

The purposes of the study were (1) to investigate the effects of delayed side-tone on the oral fluency and vocal pitch of stutterers, (2) to compare two sub-groups of stutterers on these aspects of speech, and (3) to determine whether the effects of delayed side-tone persisted in stutterers' speech after the delay was eliminated from the side-tone.

The stutterers (N = 30) read phrases and made statements about pictures, and sustained vowels after both of the foregoing kinds of speaking. The speaking occurred under the following serially ordered conditions: (1) undelayed side-tone, (2) delayed side-tone, (3) delayed side-tone [sic], (4) undelayed side-tone, and (5) undelayed side-tone preceded by six minutes of silence. The measures for each condition were the means of frequency of stuttering blocks, duration of stuttering blocks, rate of speaking, and pitch. The vocal pitch of a subject was the average fundamental frequency of four different vowels sustained under the given conditions. He, thus, sustained four vowels on each of the occasions.

The condition of delayed side-tone for each subject approximated 0.14 second. The precise delay time was individually predetermined as a delay time that seemed to reduce the severity of the subject's stuttering. An individual who did not experience any change in severity in the pretest trials talked under 0.14 second delay.

The statistical significance of differences among the mean values associated with the five experimental conditions and differential effects between the conditions and the two sub-groups of stutterers were tested by an analysis of variance. The "most severe-least severe" dichotomy was formed for each speaking task separately on the basis of the mean frequency of stuttering blocks during the first and fifth experimental conditions.

The stutterers significantly reduced the frequency and duration of their stuttering blocks and significantly increased the duration of their words and the pitch of their voice under delayed side-tone.

The sub-groups of stutterers (N = 15) responded differently to delayed side-tone. The "most severe" stutterers accounted for the significant decreases in frequency and duration of stuttering blocks while the "least severe" stutterers accounted for the significant changes in rate of speaking. Both groups increased pitch levels under delayed side-tone.

The "least severe" stutterers significantly increased the frequency of their stuttering blocks under delayed side-tone in oral reading.

Persistence effects of delayed side-tone were limited to a slight carry-over in the instance of pitch.

The following interpretations were made:

- 1) The "least severe" stutterers may have behaved similarly to non-stutterers under delayed side-tone.
- 2) The "most severe" stutterers were facilitated in speech by delayed side-tone. An inverse relationship was

found between the vocal pitch (high-low) of the "most severe" stutterers and the severity of their stuttering (high-low) during the conditions of the study. This finding was interpreted as being in keeping with a physiological explanation of stuttering.

Microfilm \$2.50; Xerox \$5.60. 113 pages.

ACCEPTANCE AND IMPROVEMENT OF ARTICULATION:

AN INVESTIGATION OF THE RELATIONSHIPS
OF ACCEPTANCE OF SELF AND ACCEPTANCE
OF SPEECH CORRECTION TO PROGRESS IN THE
CORRECTION OF FUNCTIONAL MISARTICULATIONS
SUBSEQUENT TO A PROGRAM OF SPEECH THERAPY.

(L. C. Card No. Mic 59-6255)

Gerald Woolf, Ph.D.
New York University, 1959

Problem:

This research studied the relationships of acceptance of self and acceptance of speech correction to progress in the correction of functional misarticulations subsequent to a program of speech therapy.

Hypotheses:

1. Acceptance of self, as operationally defined by this study, is positively and significantly related to improvement of articulation subsequent to a program of speech therapy.
2. Acceptance of speech correction, as operationally defined by this study, is positively and significantly related to improvement of articulation subsequent to a program of speech therapy.
3. Acceptance of self and acceptance of speech correction, as defined by this study, are positively and significantly related.

These hypotheses were derived from phenomenological theory which also helped to determine the methodology of the speech therapy program and the selection of the measures of acceptance.

Procedure:

The data of this research were secured during a program of therapy of six months duration. The subjects included twenty-seven school-age children from seven and one-half to nine and one-half years of age. All of the subjects presented functional disorders of articulation. The speech therapy program was based upon nondirective play therapy principles and methodology. Speech correction activities were provided within the framework of nondirective principles. Measures of acceptance of self, acceptance of speech correction, and improvement of articulation were obtained at the beginning of the speech therapy program and at its conclusion.

Acceptance of self was operationally defined by three behavioral rating scales. Acceptance of speech correction was operationally defined by two behavioral rating scales. The test of articulation proficiency was developed to measure the processes involved in therapy for articulation disorders, i.e., identification, auditory discrimination, speech sound production, and integration. Two judges, other than the investigator, rated each subject on the scalar measures of acceptance and also evaluated articulation proficiency.

Results:

The analysis of the data generally supported the hypotheses, but in some instances did not. The results indicate that the relationships among the variables need to be qualified according to: whether measures were made at the beginning or at the conclusion of therapy; whether the measures of acceptance involved the total scales or the sub-scales; whether the measures of articulation improvement involved the final test of articulation proficiency or the difference between initial and final tests; and whether the test of articulation proficiency involved the total test or the sub-tests.

Conclusions:

1. Acceptance of self at the conclusion of a program of speech therapy is positively related to improvement of articulation.
2. Change in acceptance of self during therapy is not related to improvement of articulation.
3. Acceptance of speech correction at the conclusion of a program of speech therapy is positively related to improvement of articulation.
4. Change in acceptance of speech correction during therapy is not related to improvement of articulation.
5. Acceptance of self at the beginning of therapy is positively related to acceptance of speech correction at the beginning of therapy and to acceptance of speech correction at the conclusion of therapy.
6. Acceptance of self at the conclusion of therapy is positively related to acceptance of speech correction at the conclusion of therapy and to change in acceptance of speech correction during therapy.
7. Change in acceptance of self during therapy is positively related to change in acceptance of speech correction during therapy.
8. Change in acceptance of self during therapy is not related to acceptance of speech correction at the conclusion of therapy.
9. Acceptance of speech correction at the beginning of therapy is inversely related to change in acceptance of self during therapy.

Microfilm \$2.75; Xerox \$9.45. 210 pages.

ZOOLOGY

THE EFFECTS OF 8-AZAGUANINE ON CLEAVAGE AND NUCLEIC ACID METABOLISM IN SEA URCHIN EMBRYOS

(L. C. Card No. Mic 60-387)

Joseph William Bamberger, Ph.D.
University of Southern California, 1959

Cochairmen: Professor Martin and
Professor Thomas

The primary purpose of this research was to determine the effects of 8-azaguanine on cleavage and the synthesis of DNA (deoxyribonucleic acid) and RNA (ribonucleic acid) in embryos of the sea urchin, *Strongylocentrotus purpuratus*. It was hoped that additional information might be obtained relative to the mechanisms by which 8-azaguanine inhibits tissue growth and/or development. Investigation of the more fundamental aspects of RNA action in differentiation would be facilitated if 8-azaguanine proved to be a tool by which RNA could be modified specifically.

One of the mechanisms which has been proposed explains 8-azaguanine effects in terms of its interference with purine synthesis, especially that of guanine. It appeared reasonable to believe that the incorporation of *de novo* guanine into the nucleic acids would be reduced if 8-azaguanine inhibited the synthesis of guanine. Therefore, the incorporation of radioactivity from glycine-1-C¹⁴ and glycine-2-C¹⁴ precursors into DNA and RNA adenine and guanine was determined for embryos exposed to 8-azaguanine during cleavage. A comparison of these results with those obtained by analysis of DNA and RNA purines from control embryos exposed only to isotopic glycine indicated that the *de novo* synthesis of both adenine and guanine was inhibited. Evidence is presented which indicates that the 8-azaguanine-induced inhibition was localized in that portion of the *de novo* pathway which involves intermediate compounds common to both adenine and guanine.

The only visible effect of 8-azaguanine on cleavage was a slight delay that first became apparent when the embryos were in the early blastula stage. A slight decrease in DNA synthesis, which may be a reflection of decreased *de novo* purine synthesis, occurred concomitantly with this delay. No incorporation of 8-azaguanine into DNA was detected.

The incorporation of 8-azaguanine into the RNA macromolecule has been demonstrated in a variety of plant and animal tissues (including tumors), protozoans, bacteria, and viruses. It has been proposed that the inhibitory effects of 8-azaguanine are due to abnormal functioning of the 8-azaguanine-containing RNA. The only known function of RNA is to participate in the synthesis of protein. Therefore, abnormalities in protein formation would be expected if the 8-azaguanine-containing RNA is functionally altered. RNA from experimental sea urchin embryos was modified to the extent that 61 per cent of its guanine moiety was replaced with 8-azaguanine. Presumptive evidence that this

RNA was functionally abnormal comes from the fact that the visible indications of 8-azaguanine inhibition coincided with the first in a series of waves of protein synthesis in the controls. It is also significant that embryos exposed to 8-azaguanine never developed beyond the blastula stage, for the process of differentiation is intimately linked with the synthesis of new, specific proteins.

The 8-azaguanine inhibition of blastulae could not be reversed with guanine as it can be in many other systems. Although these embryos are visibly undifferentiated, their potential for differentiation appears to be chemically predetermined at some time in the blastula stage. These results indicate that 8-azaguanine may be a valuable tool for modifying differentiation in sea urchin embryos.

The problem of interconversion of purines by sea urchin embryos was investigated because the possibility existed that inhibitory 8-azaadenine could be derived from 8-azaguanine if the embryo cells normally converted guanine to adenine in quantity. Results indicated that relatively little conversion of guanine to adenine takes place because no 8-azaadenine was detected in either DNA or RNA, and very little labeled adenine was obtained from isotopic guanine. Microfilm \$2.50; Xerox \$3.00. 50 pages.

THE LIFE HISTORY OF THE BLACK REDHORSE, *MOXOSTOMA DUQUESNI* (LESUEUR), IN MISSOURI

(L. C. Card No. Mic 59-6370)

Milton Lee Bowman, Ph.D.
University of Missouri, 1959

Supervisor: Robert S. Campbell

This investigation has been concerned with the life history of the black redhorse in two south central Missouri streams, the Niangua and Big Piney Rivers.

Black redhorse are spring spawners and utilize riffle areas for breeding. Males establish territories during the spawning period and it is within these territories that spawning takes place. Invariably, two males spawn with one female. The eggs are deposited in the gravel of the riffle and here early development takes place. There is no parental care of the eggs.

The body-scale relationship was best described by a combination of two straight lines. The intersection of these lines occurred at the body size attained at sexual maturity. Growth of black redhorse from the Big Piney River was better than that for black redhorse from the Niangua River. The relatively slower growth exhibited by the Niangua River black redhorse is attributed to an over abundant population.

Movements of the black redhorse are influenced by

size, season and sexual maturity. Adults have "home" pools during summer and winter. Spring and fall movements annually occur and perhaps are most extensive during the spring period. On the basis of movements and spawning behavior it can be inferred that one population exists over the entire lengths of both rivers.

The distribution of the black redhorse within its known range may be limited by availability of spawning shoals, feeding areas and shelter, which, in turn, may depend upon stream size.

The association between the black redhorse and the smallmouth bass was deemed to be beneficial to the bass. Drift foods occasioned by sucker feeding habits furnish a source of food not usually available for the young smallmouth bass. The spawn of other fish was never seen in any of the black redhorse stomachs examined.

Microfilm \$2.50; Xerox \$7.60. 162 pages.

I: BIOLOGY, ECOLOGY, AND TAXONOMY OF INSECTS INFESTING ACORNS.

II: THE USE OF SERUM PROTEINS AS AN INDICATION OF SPECIES SPECIFICITY IN LARVAL CURCULIO (COLEOPTERA, CURCULIONIDAE).

(L. C. Card No. Mic 59-6371)

Jerome Brezner, Ph.D.

University of Missouri, 1959

Supervisor: Wilbur R. Enns

I. During 1956 and 1957, 73,264 acorns representing 17 species of oak were collected from all areas of Missouri. Acorns were brought to Columbia for rearing of those insects involved in acorn depredation. Members of the genus *Curculio* (Coleoptera, Curculionidae) were found to be responsible for the majority of primary infestations.

Members of the genus *Curculio* overwinter as larvae in soil chambers beneath the forest duff. They emerge late the following summer. Oviposition follows, in late summer or early fall, when the acorns are mature.

Three species of parasites were reared, one hymenopteran and two dipterans. The degree of parasitism was very low, as found in this study. Other predators include birds, shrews, and moles.

Seven species of *Curculio* were reared. Two species were specific on the annual oaks and two others on the biennials. One species was nonspecific. The remaining two were not well enough represented for adequate appraisal of host specificity.

Taxonomy of the adults was not investigated as this work is being done elsewhere. A study of larval taxonomy was made, however no separation on the basis of external morphology could be made. An investigation of the specificity of the biochemistry of these organisms was made and forms Part II of this dissertation.

Acorn infestation rates for the annuals in 1956 was 23 per cent and 35 per cent in 1957. Biennials averaged 25 per cent in 1956 and 14 per cent in 1957. The difference in infestation between the two years has been tentatively explained as host specificity of *Curculio*, as 1957 represented a very poor mast year for the white oaks and a good year for the black oaks.

II. To aid in the separation of the larvae of the genus *Curculio*, an investigation of the biochemical specificity of these insects was initiated. It has been demonstrated previously for other animals that serological reactions, involving blood proteins were specific for each species. There were occasional references that indicated this same specificity existed for insects.

Mature *Curculio* larvae were taken from the rearing chambers in the laboratory. Blood was obtained by means of a ventral thoracic puncture. The sample was then separated into component protein fractions by means of paper electrophoresis. The protein spots were developed on the paper by means of bromphenol blue dye and analyzed quantitatively with a transmission densitometer.

A total of 60 larval blood samples was analyzed, and of these, 50 were found usable. Seven distinct qualitative patterns were found. These patterns were variations of a total of five protein fractions, three migrating positively and two negatively. The number of patterns compared exactly with the number of identified adult species found in this study. About 44 per cent of the patterns were of the type +2 -1, i.e., two spots migrating positively and one negatively. Over 41 per cent of the adults were identified as members of the *C. pardalis* complex. These two comparisons bear out the contention that in *Curculio* blood proteins are species-specific.

No definite species identifications were possible, due to the fact that the sample size was too small for adequate species appraisal. Also, no species of *Curculio* can as yet be identified in the larval stage, consequently no direct comparisons of species and protein patterns could be made.

Microfilm \$2.50; Xerox \$7.80. 168 pages.

SEASONAL LIPID LEVELS IN THREE POPULATION GROUPS OF AN OLD FIELD ECOSYSTEM

(L. C. Card No. Mic 60-481)

Clyde Eugene Connell, Ph.D.

University of Georgia, 1959

Supervisor: Eugene P. Odum

Total lipid extractions were made at seasonal intervals on three populations of an old field ecosystem: (1) the Savannah Sparrow, *Passerculus sandwichensis*, the Old Field Mouse, *Peromyscus polionotus*, and a grasshopper, *Schistocerca americana*. Field work was done at the Savannah River Plant of the AEC; samples of the populations were extracted at monthly intervals. The *Passerculus* population showed three moderately high levels of lipid content. The first was observed in early fall, and was associated with migration to the wintering grounds; the second was in mid-winter, and was attributed to recovery from effects of fall migration, colder temperatures, and abundant food (seeds); the third occurred in late April, associated with northward migration. The *Polionotus* population, present throughout the year, showed moderate fat increases in mid-winter and again in mid-summer. The first was attributed to colder temperatures and abundant food; the reasons for the mid-summer (June and July) build-up were not clear, but possibly were associated with observed inactivity of the population during the hottest

months of summer. The *Schistocerca* population showed one moderate increase in lipid content in autumn, which was attributed to storage of fat reserves for over-wintering. Only adult *Schistocerca* were extracted. Highest mean lipid indices observed in the three populations in nature were: (1) Birds: around 43% (fat as percent of dry weight) in fall migrants killed at television towers; (2) Mice: about 27%; (3) Grasshoppers: about 12%. Fattest mice were observed in winter. Highest seasonal fat levels were significantly different from lowest levels in all three populations.

Laboratory measurements of food consumption and fecal loss were made on caged specimens of all three groups. Mice and birds were highly efficient in assimilating ingested food (about 90%) while grasshoppers were only about 60% efficient. Caged Savannah Sparrows subjected to increased (15 hours) photoperiods converted a greater proportion of available food energy into fat production than did birds on normal daylight schedules (60% versus 37.5%).

A method was devised for estimating fat content of live Savannah Sparrows by reference to a table of fat-free weights of birds of different size classes as indicated by wing length. Values for the table were taken from the regression line when fat-free weight was plotted as a function of wing length. Coefficient of correlation was: $r = 0.745$. Fat content in grams was estimated by subtracting basic fat-free weight determined for each size category from total live weight.

Fat production and storage as such involved only a small proportion of the energy flow within the three populations of the old field, when considered on an annual basis, but this was less true when brief seasonal periods of fat accumulation were considered, especially in mice and birds. Average population densities of *Passerculus* were estimated to require about 1.80 Cal/M^2 in food from the old field; of this, only about 0.04 Cal/M^2 was estimated to go into fat production on an annual basis. Birds and mice combined were estimated to make considerable demands on available seed supply, but grasshoppers used only a small proportion of food available to them.

Microfilm \$2.50; Xerox \$6.00. 125 pages.

CHANGES WITH AGE IN THE LYMPHATIC TISSUES OF THE GOLDEN HAMSTER (*CRICETUS AURATUS*)

(L. C. Card No. Mic 60-520)

Sister St. Virginia Marie Cotter, Ph.D.
New York University, 1957

Adviser: Professor Harry A. Charipper

The spleen, thymus, axil and deep cervical lymph nodes of 31 golden hamsters from 13 days to 94 weeks of age were studied to observe the histological changes which occur in these tissues as the animals age.

The steady decrease in white pulp area after 20 weeks of age is a constant feature of the spleen of the hamster. Germinal centers in the splenic white pulp are characteristic of the young mature animal and undergo regression far more rapidly than the white pulp area. The few remaining in older animals differ qualitatively as well as

quantitatively from those of the 19 week old. The red pulp undergoes fibrosis only in old age.

The thymus like the spleen reaches its peak development early, shortly after puberty in the hamster. It maintains a high mitotic rate longer than the spleen, but shows the beginning of other regressive changes in both cortex and medulla at the same age as beginning involution of the splenic white pulp. Extensive fatty involution of the thymus occurs only in old age.

Hassall's corpuscles are characteristic of the young thymus, and disappear with aging. Medullary reticulum and lymphocyte components of the hamster thymus reach their maximum development together and undergo involution at the same time, unlike lymphocytes and reticular cells elsewhere.

The lymph nodes mature more slowly and maintain their activity at a later age than either thymus or spleen. In spite of differences in size and apparently in functional importance, the deep cervical and axil nodes show a similar regression of their lymphocyte components at the same time. They differ only in the extent of fibrosis which is much more marked in the axil nodes as is the hypertrophy of reticular cells in the senescent nodes.

Aging changes throughout the lymphatic tissues are similar in the hamster. They are a decline in the mitotic rate, the disappearance of germinal centers, the reduction of the area of and/or a thinning out of the lymphocyte bearing stroma, and an hypertrophy of connective tissue, the type of connective tissue and the extent of the hypertrophy differing from one lymphoid organ to another. There is an increase in the number of argyrophile fibers throughout life in all the lymphoid organs studied. Eosinophilia is not correlated with aging in the lymphatic tissues of the hamster.

Microfilm \$2.50; Xerox \$6.60. 139 pages.

DIFFERENTIATION OF THE GLYCOGEN BODY OF THE CHICK EMBRYO UNDER NORMAL AND EXPERIMENTAL CONDITIONS

(L. C. Card No. Mic 59-6301)

Louis D. De Gennaro, Ph.D.
Syracuse University, 1959

Supervisor: Hiram J. Evans

Differentiation of the glycogen body of the chick embryo was studied under conditions of normal development, chorio-allantoic grafting and tissue culture *in vitro*. The periodic acid-Schiff's reaction was used to stain the cells of the glycogen body and diastase or saliva was used to identify glycogen. Several different techniques of staining were employed in order to study the morphology of the cells of the glycogen body.

Normal development of the glycogen body was studied by means of paraffin sections taken from the lumbo-sacral regions of chick embryos at daily intervals from 7 thru 19 days of incubation and from 1 day old chicks.

Lumbo-sacral regions of 33-48 hour, 3-4 day and 7-8 day embryos were transplanted to the chorio-allantoic membranes of 8-9 day chick embryos. Cervical regions were transplanted as controls. Grafts were recovered from the chorio-allantois after 10 days and studied by means of paraffin sections.

Nerve cord was isolated from the lumbo-sacral regions of 6, 8, 12 and 14 day embryos, prepared as a suspension of cells and cultured for 12 days *in vitro*. Cervical nerve cords were cultured as controls. Cultures were stained and examined for the presence of glycogen body cells.

The following results were obtained: The glycogen body appeared in the chick embryo between 7-8 days of incubation. At that time, glycogen-storing cells were found in the ependymal cone and lateral margins of the roof plate at the lumbo-sacral level of the embryonic nerve cord. There was a rapid increase in the number of glycogen-storing cells in the roof plate during subsequent days of incubation, so that by 10-12 days, a conspicuous mass of tissue (the glycogen body) was seen located between the dorsal halves of the nerve cord in the lumbo-sacral region of the embryo. There was a continual increase in the size of the glycogen body during the remainder of incubation. The tissue of the glycogen body was found to consist almost entirely of glycogen-storing cells which were oval or polyhedral in form. Glycogen was found in these cells throughout incubation and on the first day of hatching. It was found that growth and differentiation of the glycogen body involved mitotic proliferation of cells, an increase in the individual size of the cell and the accumulation of glycogen.

Differentiation of the glycogen body was found in chorio-allantoic grafts which were recovered from transplants of the lumbo-sacral regions of the embryo. These results showed that the glycogen body was not primarily dependent upon higher levels in the intact nerve cord for growth and differentiation. It was found that the stem cells of the glycogen body were present in the lumbo-sacral region of the nerve cord as early as 33-48 hours of incubation.

Glycogen body cells were found to proliferate and accumulate glycogen *in vitro*. Stem cells of the glycogen body in cell cultures of 6 and 8 day lumbo-sacral nerve cords were found to differentiate into cells of the glycogen body.

The results of this investigation suggest that the glycogen body arises in the chick embryo primarily by an innate capacity of the cells to synthesize glycogen.

Microfilm \$2.50; Xerox \$3.80. 69 pages.

MUSKRAT REPRODUCTION, GROWTH, AND MOVEMENT IN SMALL WATER AREAS OF CENTRAL NEW YORK.

(L. C. Card No. Mic 60-620)

Howard Ralph Erickson, Ph.D.
Cornell University, 1959

Reproduction, growth, and movement activities of muskrats in 41 small water areas of Central New York were studied the year round from February, 1957 through July, 1959. Information was secured from over 700 muskrats, primarily through live-trapping although some steel-trapping was used. Live-trapped muskrats were ear-tagged, sexed, aged, weighed, measured, examined for general condition, and released. Data from three breeding seasons indicated that the onset of breeding was highly correlated with the beginning of spring movement. Evi-

dence was obtained that these muskrats were probably monogamous. No indications of precocial breeding were present in 37 immature females examined in the fall. Two adult females, bred in captivity, produced litters of six and three young after gestation periods of 28 and 29 days respectively. Adult females from the study area averaged approximately 6.3 young per litter, and nearly 1.5 litters per year. The sex ratio in 174 nestlings was 105 males to 100 females; in 279 September-trapped immatures it was 118 to 100; in 228 adults trapped from July through October, it was 93 to 100. The age ratio in 364 September-trapped muskrats was 328 young per 100 adults, or 5.9 young per adult female. Fifty-three young muskrats constituting nine litters were born and raised in captivity. Weight, total length, tail length, and hind foot length data were secured from these young at intervals of one week or less, and growth curves were plotted through 50 days of age. Examination of 19 wild litters made possible a comparison of growth rates of captive and wild litters. Limited information concerning growth of muskrats through their second breeding season was obtained. Second-year adults, as a group, were much larger than first-year adults, but the two groups overlapped significantly in both weights and measurements. Adult males generally were larger than adult females, but much overlap was evident here also. Movements of muskrats were studied during spring, summer, and fall periods in study ponds, and in possible routes of movement such as ditches and freshets. The spring movement period was by far the most active. It appeared to be triggered by break up of ice on ponds resulting from several days of warm weather. Details of 39 spring movements of tagged muskrats were recorded, the longest of which was about one mile. Many untagged individuals moved into study area ponds or were found dead on highways some distance from habitable water. Summer and fall movements occurred at a much lower intensity than spring movements. Summer movements were very infrequent and usually covered shorter distances. Data suggested that intraspecific strife is associated with fall movement. No particular causes were apparent to explain summer movement. Summer home ranges of adults were studied on a small marsh in 1958. Twenty-one adults were present. Home ranges of 10 males coincided with those of 10 females to such an extent that pairing was indicated. Both members of these "pairs" were often captured on the same dwellings and feeding stations. One adult male apparently remained unmated during the three-month period of study. His home range was larger than those of the 10 "paired" adults and overlapped several of them. Home ranges averaged approximately 200 feet in diameter. The ranges of several "paired" adults overlapped slightly. Homing data were obtained from 19 ear-tagged, immature and adult muskrats released one or more times at varying distances and directions from home ponds. Some animals were released on other ponds, others along roadsides. Eleven homed once. One muskrat homed five times; his longest return was 4800 feet overnight.

Microfilm \$2.50; Xerox \$5.60. 112 pages.

STUDIES OF SEVEN SPECIES OF MOSQUITOES AS POTENTIAL VECTORS OF FILARIAE AFFECTING SKUNKS AND SQUIRRELS

(L. C. Card No. Mic 59-2790)

Burton Robert Evans, Ph.D.
University of Maryland, 1958

Supervisor: Dr. William E. Bickley

The purpose of this study was to determine potential mosquito vectors of microfilariae from the skunk (*Mephitis mephitis* Peale and Palisat de Beauvoir) and the gray squirrel (*Sciurus carolinensis carolinensis* Gmelin). Microfilariae observed in these two animals have not been described. There appear to be three species in the skunk, a short unsheathed microfilaria (designated "type B" - apparently *Dipetalonema*); a long unsheathed microfilaria (designated "type C" - apparently *Dipetalonema*); and a short sheathed microfilaria (designated "type D" - *Dipetalonematidae*). There appears to be one species in the gray squirrel (designated "type A" - *Dipetalonema*).

Infected animals were collected at the Agricultural Research Center, Beltsville, Md.; the Patuxent Research Refuge, Laurel, Md.; the National Zoological Park, Washington, D. C.; and the Blackwater National Wildlife Refuge, Dorchester County, Md.

Mosquitoes were allowed to feed in the laboratory on infected animals and were dissected at intervals after engorgement. Examination of the gut, the haemocoel of the abdomen, the thorax, and the head for possible development of microfilariae within each was then made. Those species tested as potential vectors were *Aedes triseriatus* (Say), *A. vexans* Meigen, *Culex pipiens* Linnaeus, *C. salinarius* Coquillett, *Mansonia perturbans* (Walker), *Psorophora ferox* (Humboldt), and *Anopheles punctipennis* (Say).

The collection, maintenance, and manipulation of the mosquitoes are discussed. Laboratory and field equipment are described. Photographs of equipment, microfilariae, disintegrated forms, and developmental stages are included. Biting collection records from the Patuxent Research Refuge for a period during 1957 are appended.

Dissection of 153 *Psorophora ferox* females made from 0 to 11 days after engorgement on a skunk revealed type C microfilariae in the mid-gut, but no developing forms were observed.

Microfilariae types B and C from skunks were observed in the mid-gut of 193 *Aedes triseriatus* females dissected from 0 to 12 days following a blood meal; similarly they were observed in 24 *A. vexans* (1 to 6 days), 35 *Culex pipiens* (1 to 12 days), 112 *C. salinarius* (0 to 12 days), 43 *Mansonia perturbans* (1 to 9 days), and 18 *Anopheles punctipennis* (0 to 18 days); but no development could be detected. Microfilariae were found in the feces of *C. pipiens* and *C. salinarius*. Brown pigmented non-motile microfilariae were observed in the mid-gut of *C. pipiens*, *C. salinarius*, and *M. perturbans*.

Microfilariae type A from gray squirrels were observed in the mid-gut of 159 *Aedes triseriatus* dissected 0 to 12 days after a blood meal; likewise they were observed in 32 *Culex pipiens* (1 to 12 days), 99 *C. salinarius* (0 to 11 days), and 59 *Psorophora ferox* (1 to 7 days); but no development was detected. Brown pigmented microfilariae were observed in the mid-gut of *C. pipiens* and *C. salinarius*. Microfilariae were seen in the feces of *A. triseriatus* and *C. salinarius*.

Microfilariae type A from squirrels were observed in the mid-gut of 46 *Anopheles punctipennis* females dissected from 1 to 20 days after a blood meal. First stage larvae or "sausages" were observed in the haemocoel of the abdomen, the thorax, and the head from 2 to 20 days after engorgement. Brown pigmented "sausages" were observed in the thoracic muscles.

Anopheles punctipennis was the only species studied in which developing filariae were observed.

Microfilm \$2.50; Xerox \$5.80. 118 pages.

RELATIONSHIP OF THE MOLECULAR STRUCTURE OF CERTAIN ORGANOPHOSPHORUS COMPOUNDS TO SYSTEMIC AND OTHER INSECTICIDAL ACTIVITY

(L. C. Card No. Mic 59-5273)

Arthur Davis Flynn, Ph.D.
Alabama Polytechnic Institute, 1959

Supervisor: William G. Eden

Eighteen synthetic organophosphorus compounds were tested for systemic insecticidal activity in order to determine effects of variation in the molecular structure by administering the compounds orally to rabbits and allowing bloodsucking arthropods to feed on the treated rabbits. All 18 of the compounds were tested against the bed bug, *Cimex lectularius* L.; the Gulf Coast tick, *Amblyomma maculatum* Koch; the yellow fever mosquito, *Aedes aegypti* (L.); and the stable fly, *Stomoxys calcitrans* (L.).

Experiments were also conducted to determine the relative toxicity by topical applications of 16 of these compounds to the unfed adult bed bug and 14 compounds to the engorged adult stable fly.

The compounds that exhibited systemic insecticidal properties against the bed bug, the Gulf Coast tick, the yellow fever mosquito, or the stable fly and their per cent mortalities, respectively, were: trimethyl phosphorothioate, 0.0, 3.0, 0.0 and 0.0; trimethyl phosphate, 0.0, 31.6, 80.0 and 66.6; 0,0-dimethyl 0-(phenyl) phosphate, 0.0, 5.5, 0.0 and 0.0; 0,0-dimethyl 0-(2,4,5-trichlorophenyl) phosphate, 100, 5.4, 17.4 and 100; 0,0-dimethyl 0-(2,4-dichlorophenyl) phosphate, 100, 91.6, 100 and 100; 0,0-dimethyl 0-(4-chlorophenyl) phosphate, 0.0, 21.2, 7.7 and 93.3; 0,0-dimethyl 0-(2-chlorophenyl) phosphate, 0.0, 33.3, 0.0 and 100; 0,0-dimethyl 0-(2,4,6-trichlorophenyl) phosphate, 0.0, 0.0, 7.7 and 33.3; 0,0-dimethyl 0-(2,5-dichlorophenyl) phosphate, 0.0, 0.0, 28.6 and 100; 0,0-dimethyl 0-(phenyl) phosphorothioate, 10.0, 14.8, 0.0 and 26.6; 0,0-dimethyl 0-(2,4-dichlorophenyl) phosphorothioate, 12.5, 76.3, 0.0 and 100; 0,0-dimethyl 0-(2-chlorophenyl) phosphorothioate, 0.0, 4.7, 0.0 and 100; 0,0-dimethyl 0-(4-chlorophenyl) phosphorothioate, 0.0, 0.0, 0.0 and 21.4; 0-methyl 0-(2,4,5-trichlorophenyl) phosphorothioate, 100, 73.3, 0.0 and 0.0; 0,0-diethyl 0-(2,4-dichlorophenyl) phosphorothioate (VC-13), 0.0, 6.6, 3.8 and 40.0; 0-methyl 0-(2,4,5-trichlorophenyl) phosphoramidothioate (Dow ET-15), 60.0, 4.8, 64.4 and 100; 0,0-dimethyl 0-(2,4,5-trichlorophenyl) phosphorothioate (ronnel), 100, 23.1, 0.0 and 100.

The LD-50's of the insecticides in micrograms per bed bug and stable fly, respectively, were as follows: trimethyl phosphorothioate, 31.5 and 29.2; trimethyl phosphate, 146.0

and > 238.04; 0,0-dimethyl 0-(phenyl) phosphate, 31.0 and 6.63; 0,0-dimethyl 0-(2,4,5-trichlorophenyl) phosphate, 0.043 and 0.0079; 0,0-dimethyl 0-(2,4-dichlorophenyl) phosphate, 0.429 and 0.0228; 0,0-dimethyl 0-(4-chlorophenyl) phosphate, 13.45 and 0.544; 0,0-dimethyl 0-(2-chlorophenyl) phosphate, 4.87 and 0.0096; 0,0-dimethyl 0-(2,4,6-trichlorophenyl) phosphate, 4.47 and 2.38; 0,0-dimethyl 0-(2,5-dichlorophenyl) phosphate, 0.83 and 0.0147; 0,0-dimethyl 0-(phenyl) phosphorothioate, 10.13 and not tested; 0,0-dimethyl 0-(2-chlorophenyl) phosphorothioate, 113.2 and 1.38; 0,0-dimethyl 0-(4-chlorophenyl) phosphorothioate, 71.5 and 10.25; 0-methyl, 0-ethyl 0-(2,4,5-trichlorophenyl) phosphorothioate, 0.083 and 0.0469; 0,0-diethyl 0-(2,4-dichlorophenyl) phosphorothioate (VC-13), 3.44 and 0.0516; 0-methyl 0-(2,4,5-trichlorophenyl) phosphoramidothioate (Dow ET-15), 0.054 and 0.0191; 0,0-dimethyl 0-(2,4,5-trichlorophenyl) phosphorothioate (ronnel), 0.032 and 0.0324. Microfilm \$2.50; Xerox \$8.40. 181 pages.

MODIFIED DEVELOPMENT OF THE INTEGUMENT OF HYPOPHYSECTOMIZED CHICK EMBRYOS.

I. THE EPIDERMIS.

II. THE FEATHER GERMS.

(L. C. Card No. Mic 60-431)

Gerald Conrad Goeringer, Ph.D.
Northwestern University, 1959

It has become increasingly evident that growth and development of a multitude of organ systems in the chick embryo is intimately related to functional activity of the endocrines. For example, Bartels has shown that a precocious development of the epidermis and cornification of the down feathers follow injection of thyroxin into the chick embryo. To test this hypothesis that epidermal differentiation is initiated by thyroxin release, epidermal development was analyzed in chick embryos rendered hypothyroidic following hypophysectomy by partial decapitation. Normal epidermal differentiation was arbitrarily divided into a series of readily identifiable morphological stages, and epidermal development in operated embryos was classed according to the comparable stage of normal development attained. It was found that in the absence of pituitary, epidermal differentiation was retarded to varying degrees. However, complete, or almost complete, epidermal differentiation did occur if hypophysectomized embryos survived for a long enough time. Thus, development of epidermis appears to be rate-controlled by, rather than causally dependent on, thyroid secretions. In this respect, epidermal development differs from other hormone-related systems thus far studied in the chick embryo.

Virtually nothing is known about hormonal influence on embryonic plumage development. Unpublished observations by Watterson indicated a highly modified condition in the plumage of pituitaryless chick embryos. Paralleling the above-mentioned investigation, a gross and a histological analysis was made of flight-feather development in normal and hypophysectomized chick embryos. Gross observations revealed varying degrees of structural distortion as well as a marked blood-stasis in the distal pulp region of the developing down feathers. Concurrent with, and secondary to, the vascular aberrations, pulp-cap for-

mation was highly modified. Various other less-consistent abnormalities, possibly representing generalized growth defects due to hormonal imbalance, were also described. Growth curves for selected flight feathers were plotted and revealed that feather length belatedly reached the level attained by 16-day controls and thereafter stopped increasing. The growth curves so obtained are similar to those of other hormone-dependent embryonic systems, e.g., thyroid, adrenal, and duodenal growth. Thus, it appears that normal feather growth is hormone dependent.

The results of this investigation show that two components of the integument, viz., the epidermis and feather germs, react differently in their response to a hypothyroid condition. Microfilm \$2.50; Xerox \$4.40. 82 pages.

AN INVESTIGATION OF FACTORS WHICH AFFECT COLONY FORM AND GROWTH IN *GONIM PECTORALE*

(L. C. Card No. Mic 60-744)

Lynn Boyd Graves, Jr., Ph.D.
The Ohio State University, 1959

When *Gonim pectorale* is found in abundance in nature, almost all the colonies are normal 16-celled colonies. However, when the organism is cultured under ordinary laboratory conditions, many of the colonies contain fewer than 16 cells even during the first few days. As the cultures grow older, the number of non-16-celled forms increases, and by the end of a month, most of the forms which remain are 1-celled. A subculture made at any stage, including one consisting chiefly of 1-celled forms, goes through the same stages as did the original.

It is obvious, then, that the conditions which obtain in ordinary laboratory cultures of this species are not, even at the outset, adequate for the normal development of all the colonies in a culture, and become less adequate with the passage of time. Various possible explanations have been considered, and experiments were performed to test some of the factors that might be involved.

It was found that the addition of up to 1/88 M carbonate to the culture medium increased the relative abundance of 16-celled colonies, but did not alter the initial rate of growth, when compared with cultures which had less or no carbonate added. After a concentration of fifty cells per cubic millimeter was reached, the carbon supply in the medium with no added carbonate became insufficient to support growth at the initial rate. The culture containing the added carbonate was able to divide at the initial rate for a much longer period. Concentrations of carbonate stronger than 1/88 M seemed harmful to the form of the colony and to the rate of growth.

The presence of traces of iron in the culture medium was found necessary for both normal colony formation and for normal cell growth.

The relative abundance of normal colonies was found to be in direct proportion to the logarithm of the calcium ion concentration. Growth was not possible in the absence of the calcium ion, but 0.0007 milligram of calcium per liter of solution was sufficient for normal cell growth.

Filtrates of aged cultures had a deleterious effect on the form of the colony and on the rate of growth in

proportion to the age of the culture from which the filtrate was obtained.

Normal colony formation, growth, and motility seemed unimpaired within pH values ranging from 4.0 to 7.7. Colonies started to degenerate and growth ceased at pH values above 8.0. *Gonium* seemed to be killed at about pH 10.5.

Deficiencies of inorganic carbon and of iron produce abnormal colonies and lower the rate of growth of a culture, presumably through an impairment of cell reproduction. However, a deficiency of calcium lessens the ability of cells to adhere to each other. Therefore, sister cells formed in cell division often do not adhere to each other, and already formed colonies break up more easily. The form of the colony tends to become disrupted at pH values above 8.0, and growth and reproduction cease. It is presumed that the main toxic effect of filtrates of aged cultures is due to the alkalinity of the fluid.

Microfilm \$2.50; Xerox \$4.60. 87 pages.

CRITICAL THERMAL MAXIMA IN SALAMANDERS

(L. C. Card No. Mic 60-466)

Victor Hobbs Hutchison, Ph.D.
Duke University, 1959

Supervisor: I. E. Gray

This study consisted of the determination of a standard method for measuring the critical thermal maximum (CTM) in salamanders and experimental examination of some of the factors influencing it, with a comparison of the CTM in twenty-nine species and subspecies.

The rate of acclimation of newts, *Diemictylus viridescens viridescens*, was slower at the lower temperatures than at the higher ones. Newts transferred from 4.0°C to 20.0°C showed a complete acclimation within forty-eight hours; from 19.5°C to 32.0°C, within twenty-nine hours; from 20.0°C to 3.0°C, within seventy-two to ninety-six hours.

A single repeated exposure to the CTM resulted in significantly higher values of the CTM thirty minutes after the first exposure. This increased tolerance gradually declined for 3900 to 4300 minutes, when the CTM of the first and the repeated determinations were not significantly different.

Significant positive correlations were found between the time required to reach the CTM in a constant temperature test bath and the body size in *Diemictylus viridescens* and *Ambystoma opacum*.

Resistance times at constant test temperatures for several species of salamanders showed a well-marked effect of acclimation on the time required to produce death.

The relation of acclimation temperature to the CTM in nine different collections of *Diemictylus viridescens* also showed the pronounced effect of acclimation on the CTM, as well as seasonal and geographic variations which are not overcome by acclimation periods as long as six months. Lower portions of acclimation-CTM curves were linear, but the upper portions (higher temperatures) showed an upward break in the curve. A collection of *Ambystoma opacum* did not show this upward break, but

reached a plateau at approximately 31.0° in acclimation temperature.

Geographical and seasonal variation in the CTM was also found in fifteen different collections of *Diemictylus viridescens* acclimated at 20.0°C. *Diemictylus viridescens viridescens* had significantly lower CTM than *D. v. dorsalis* and *D. v. louisianensis*. The last two races have ranges in warmer climates.

Preliminary experiments on the influence of photoperiod on the CTM furnish evidence that at least part of the seasonal variation in the CTM is photoperiodically controlled. Newts kept under conditions of a seven-hour photoperiod centered at noon had a CTM significantly lower than those kept under constant darkness and constant light. These differences were approximately the same for animals kept at 4.0°C and at 20.0°C for periods of up to six weeks.

Larvae of *Diemictylus viridescens viridescens* had a CTM significantly lower than adults from the same population. There were no significant differences between the eft and newt stages in another population.

Newts desiccated to a 14.0 - 21.5 percent loss of their original body weight showed a CTM significantly higher (1.07°C) than controls kept under the same conditions but not dehydrated.

Salamanders transferred from an acclimation temperature of 4.0°C to a temperature of 20.0°C lost weight rapidly because of a loss of water. A new equilibrium was reached after sixteen to twenty-one days. At this time the weight loss averaged 19 percent. Newts transferred from 20.0°C to 4.0°C showed a rapid gain in weight during the first two days, at the end of which time the increase in weight averaged 5.7 percent. From this point, there was a very gradual increase for 19 days, at the end of which the weight increase averaged 6.3 percent.

A comparison of the CTM of twenty-nine species and subspecies of salamanders acclimated at 20.0°C shows that, in general, there is a correlation between the CTM and the habitat and range of the species or subspecies.

The value of the concept of the CTM and its application in ecological studies is discussed.

Microfilm \$2.50; Xerox \$6.60. 137 pages.

BIOLOGICAL AND BIOCHEMICAL INVESTIGATIONS ON THE NEMATODE, *SYNGAMUS TRACHEA* (MONTAGU, 1811) CHAPIN, 1925.

(L. C. Card No. Mic 60-540)

Russell Francis Krueger, Ph.D.
Michigan State University, 1958

Major Professor: David T. Clark

The purpose of this investigation was to study parasitism as it is represented in the life cycle of the nematode, *Syngamus trachea*, and concurrently to establish biochemical characteristics of this species with special emphasis on the role of respiration and carbohydrate metabolism.

Oral, intravenous, intraperitoneal, and subcutaneous routes of inoculation of chickens and turkeys were tried. No infection was obtained with intraperitoneal and subcutaneous inoculation. A previously untried route of infection,

intravenous inoculation of suspensions of larvae, proved to be superior to established methods because of the ease of controlling the degree and intensity of infection. *Syngamus* was recovered from the trachea as early as eight days following intravenous inoculation and had a $14\frac{1}{2}$ day prepatent period. Oral inoculation resulted in gapeworms in the trachea on the ninth day and a prepatent period of 15 days.

After approximately two weeks of age chickens became more difficult to infect and after three to four weeks of age became refractory to gapeworm infection. Turkeys as old as 186 days could easily be infected. The intensity of gapeworm infections in turkeys began to decline after 24 days and by 37 days infections were negligible. Gapeworms were recovered from turkeys as long as 82 days after inoculation.

The red pigmented pseudocoelomic fluid of *Syngamus* appears to be an iron porphyrin compound which is probably a hemoglobin. This hemoglobin is not identical with that of the host's hemoglobin. These hemoglobins are compared and differences noted.

Wet and dried weight values covering the life span of *Syngamus* in the trachea of turkeys are given. The percent dried weight of paired *Syngamus* was $26.2\% \pm 2.9\%$.

The metabolic activities of *Syngamus* — aerobic oxygen consumption and carbon dioxide liberation, endogenous and exogenous carbohydrate utilization, carbohydrate content, butyric acid utilization, and anaerobic carbon dioxide liberation — were most pronounced in the youngest and smallest gapeworms. These metabolic activities all gradually decreased as the weight of the gapeworms increased. There appeared to be a relationship of metabolic activity to egg production.

Respiration studies were conducted by standard manometric techniques. The rate of oxygen utilization of paired *Syngamus* decreased from 18.54 to 4.08 microliter per mg dried weight per hour as the worms aged and increased in weight. The rate of oxygen consumption was decreased by such inhibitors as azide, cyanide, 2,4-dinitrophenol, fluoride, iodoacetate, and malonate. Inhibition by fluoride and malonate took place only in a calcium free substrate. Oxygen utilization by *Syngamus* was also decreased following gassing with carbon monoxide and was further decreased when gapeworms were maintained in darkness. The respiratory quotient (RQ) in a phosphate buffered substrate, with or without 0.005 M glucose, was approximately 0.87. In a substrate containing 0.065 M butyric acid the RQ for *Syngamus* was 0.708. A RQ of approximately 1.0 was obtained with an acetone powder prepared from *Syngamus* in a substrate containing 0.005 M glucose.

The range of the polysaccharide content in *Syngamus* was 0.33% to 0.76% and the rate of endogenous polysaccharide utilization was about 0.35% wet weight of *Syngamus* per 24 hours. Exogenous glucose utilization decreased with increased size of gapeworms from 3.89 to 0.23 mg per gram wet weight per hour. There was a pronounced increase in the rate of exogenous glucose utilization when gapeworms were maintained *in vitro* for ten days.

Microfilm \$2.50; Xerox \$5.20. 103 pages.

THE CEPHALIC NERVOUS SYSTEM OF A CENTIPEDE, *ARENOPHILUS BIPUNCTICEPS* (WOOD).

(L. C. Card No. Mic 60-347)

Michael Aloysius Lorenzo, Jr., S.J., Ph.D.
St. Louis University, 1959

Centipedes are arthropods belonging to the class, Chilopoda, of which there are four orders: Scutigleromorpha, Lithobiomorpha, Scolopendromorpha, and Geophilomorpha. Investigations of the nervous system have been restricted to the larger, more common representatives of the first three orders. Relatively little attention has been given to that system in the Geophilomorpha. The purpose of the present study was to investigate the cephalic neuroanatomy of a widely distributed geophilomorph, *Arenophilus bipuncticeps* by the use of modern microtechnical procedures, particularly silver impregnation.

Specimens were collected in the vicinity of Bellefontaine and Florissant, Missouri and fixed in a modified Bouin's solution. Serial sections were prepared and impregnated with silver protein and counter-stained with cresyl violet. The gross morphology of the cephalic nervous system was graphically reconstructed from the sections. Photographic techniques were employed to aid in the interpretation of histologic relationships.

The head of geophilomorphs is spade-like, and the cephalic nervous system is compressed dorsoventrally, resembling superficially that of the Annelida. The supraoesophageal ganglion, or "brain," is divisible histologically into a proto-, deuto-, and tritocerebrum. Since the head of *Arenophilus* is only about a millimeter in length, however, it is not possible to identify these neuromeres in whole mounts. The brain is connected to an elongate suboesophageal ganglion by long, cord-like circumoesophageal connectives. Most of the cephalic nerves emerge from the ventral surface of the two ganglia.

The antennal nerves emerge rostrally and are the largest in the nervous system. Intrinsic and extrinsic motor antennary nerves are identified. They are traceable to nuclei of origin in ventral portion of the deutocerebrum about sixty micra from the anterior limit of the brain. A nerve to the cerebral gland emerges from the ventrolateral surface of the frontal lobe. A sensory nerve to the lateral clypeus enters the lateral border of the frontal lobe cranial to the cerebral gland. An unpaired recurrent nerve, flanked by a pair of labral nerves, emerges ventrally from the tritocerebrum and bifurcates on the dorsal surface of the oesophagus. Anterior to the root of the recurrent nerve a stomatogastric bridge is located. This is the first anterior fibrous interconnection between the two halves of the supraoesophageal ganglion. No "free tritocerebral commissure" exists in *Arenophilus* as in other chilopods and insects. The nerves to the mouth parts emerge ventrolaterally from the suboesophageal ganglion and contain both motor and sensory components.

The neurohistology of *Arenophilus* is characteristic of arthropods. The neurilemma is composed of an outer homogeneous "neural lamella" and an inner cellular "perilemma" whose nuclei are distinguishable on the basis of staining qualities. There are at least two types of neuroglial cells. They may be differentiated by their chromatin properties.

In addition to the typical motor and associational neurons in the cortex, four large neurons, or "giants," are located ventrally in the suboesophageal ganglion. They resemble the neurosecretory cells described in other arthropods.

Silver impregnation of the nerve fibers in the neuropile reveals a definite pattern. The neuromeres of the brain are readily identified. Lateral and medial deutocerebral lobes are present and "antennal glomeruli" are seen. A "corpus lamellosum" and an "olfactorio-globularis" tract are also found. Commissures located in the median plane of the brain may be homologized with those of other chilopods. No structures homologizable with the "corpora pedunculata" and the "central complex" of the other chilopods and social insects are present.

The morphology of the cephalic nervous system is influenced by the size and shape of the cephalic capsule and by the absence of eyes and Organs of Tömösvary. The organization is less complex than in the cephalic nervous systems of the other chilopod orders.

Microfilm \$2.50; Xerox \$5.40. 108 pages.

THE FEMALE REPRODUCTIVE CYCLE
OF THE CRAYFISH, CAMBARELLUS SHUFELDTI:
THE INFLUENCE OF ENVIRONMENTAL
AND ENDOCRINE FACTORS.

(L. C. Card No. Mic 60-362)

Mildred Eileen Lowe, Ph.D.
Tulane University, 1959

Chairman: Milton Fingerman

The reproductive cycle of the female crayfish Cambarellus shufeldti was defined. Field collections were made at least once a month from November 1957 through April 1959. While females carrying eggs on their pleopods could be found almost any time throughout the year, there were two peaks of reproductive activity, the largest in late winter-early spring, the other in June. These periods occurred at the beginning of the hottest portion of the year which is also the time of longest day-length and shortly after the coldest portion of the year and shortest day-length.

Three distinct groups of adult females appeared in the population during the year as determined by total body weight and cephalothorax length. Individual crayfish probably lived no longer than a year and no longer than six months as adults. During this time an animal could reproduce twice.

Under increased photoperiod there was a more rapid cycling of the maturation and resorption of oocytes, while decreased day-length tended to stabilize the ovary in a mature condition.

Lowered temperature tended to slow maturation of oocytes while at elevated temperatures there was quick maturation followed by disintegration of the ovary.

Environmental factors are apparently mediated by endocrine organs rather than acting directly on the ovary. This was shown by the effect of eyestalk ablation and by the effect of implanting the sinus gland and central nervous organs.

A hypothesis involving the presence of four endocrine factors controlling ovarian growth is presented. Cold temperatures and short photoperiods initiate the secretion of ovary-inhibiting substances which make the ovary develop slowly, while high temperatures and long day-lengths at first inhibit this secretion, allowing a quick maturation of the ovary. The endocrine glands become refractory to continued steady environmental conditions and thus the cyclic increase and decrease in ovarian size occurs more than once a year.

The presence of gonadal hormones in crayfish was not yet proved. In C. shufeldti the development of the cement glands is probably controlled by a hormone from the eyestalk rather than from the ovary itself.

Microfilm \$2.50; Xerox \$4.40. 85 pages.

SOME GENERAL ASPECTS CONCERNING THE TOXIC
AND PHYSIOLOGICAL EFFECTS
OF COPPER SULPHATE ON FISH

(L. C. Card No. Mic 60-782)

Robert Fortunat Normandin, Ph.D.
The Ohio State University, 1959

The problem was divided into three phases. Phase I of the study was conducted at the Franz Theodore Stone Laboratory, Put-In-Bay, Ohio, during the summers of 1957 and 1958. The concentrations of copper sulphate that were lethal to seven species of fish were studied. An attempt was made to relate these lethal concentrations to temperature, pH, and methyl orange alkalinity. A proportionate correlation was observed between the lethal dosages affecting the small mouth black bass, Micropterus d. dolomieu, and the alkalinity of the water. These experimental dosages were plotted against the corresponding alkalinity. The Regression Curve representing the average of these data was proposed as an Index Curve since the lethal concentrations to alkalinity values of this Regression Curve correlated with the experimental values. The feasibility and practical value of such an Index Curve were discussed.

Phase II was a study, by the continuous flow method, of the effect of copper sulphate on the oxygen consumption of the goldfish, Carassius auratus. An initial drop in oxygen consumption, accompanied by a similar drop in water temperature was observed. However, after this initial decrease the oxygen consumption, rather than showing a gradual decrease, remained generally steady over a 48-hour test period.

Phase III was a study of the relationship between the test concentrations of copper sulphate and the physiological course of the copper in the goldfish, Carassius auratus. Radiation tracer techniques were used in the study with radioactive copper-64 as the tracer element.

It was found that in most cases an inverse relationship existed between the test concentration and the amounts of copper-64 detected in the various organs of the fish. It was also found that the amount of copper-64 detected in the various organs was generally influenced by the water conditions, whether still or flowing, under which the animal was tested.

Microfilm \$2.50; Xerox \$4.20. 76 pages.

STUDIES ON THE UPTAKE OF UREA BY FROG AND MAMMALIAN KIDNEY SLICES

(L. C. Card No. Mic 60-412)

Roberta M. O'Dell, Ph.D.
Duke University, 1959

Supervisor: Bodil Schmidt-Nielsen

Evidence has appeared in the literature that lends support to the idea that urea may be actively handled by the mammalian kidney tubule.

The *in vitro* method was employed to investigate the possibility of active uptake of urea by the mammalian kidney tubule. Initial studies were conducted on frog kidney slices because the frog is known to actively secrete urea *in vivo*. The results of these studies showed that the frog kidney was able to maintain a concentration of urea higher than the medium in which it was incubated. In *Rana catesbiana*, the average slice-medium difference was 12.6 mM/l in the dorsal portion containing proximal tubules and 6.55 mM/l in the ventral part of the kidney containing distal tubules. In *Rana pipiens* the average slice-medium difference was 10.5 mM/l. Muscle, used as a control tissue showed no significant uptake.

The rat was then used as an experimental animal and rat kidney slices, incubated under physiological conditions, showed an average slice-medium difference of 2.79 mM/l. When the kidney of the rat was divided into three separate zones: cortex, outer zone and inner zone of the medulla, somewhat higher slice-medium differences were generally found in the cortex and outer zone. Muscle showed no significant concentration difference from the medium. Slices of sheep, beaver and rabbit kidney also exhibited the ability to maintain a urea concentration above the medium.

In rat kidney slices slice-medium difference was significantly depressed by 0.02 M cyanide and by nitrogen. 2,4 Dinitrophenol (0.003 M) was an effective inhibitor in the frog kidney slices but not in the rat kidney slices which is in agreement with the *in vivo* findings of other investigators.

Isotope studies on rat kidney slices, using C¹⁴ labeled urea, indicated that the slice-medium urea concentration differences observed chemically were not due to active uptake from the incubating medium since the concentration of C¹⁴ in the medium and the slice were identical, in both frogs and rats.

It is suggested that the system involves some type of active binding of urea which is sensitive to the action of inhibitors. There may exist, in the cells of the kidney tubule, a carrier that forms a complex with urea in transporting the compound across the intracellular space. This carrier is saturated with urea when the slice is removed so that no more can be taken up from the medium. This hypothesis would explain the isotope results. The carrier-complex is sensitive to the action of metabolic inhibitors so that it breaks down and urea is released.

Further studies, using various metabolic intermediates and C¹⁴ labeled urea should throw more light on the actual mechanism involved.

Microfilm \$2.50; Xerox \$3.60. 63 pages.

THE DEVELOPMENT AND MORPHOLOGY OF THE LARVAL STAGES OF DIROFILARIA IMMITIS (LEIDY, 1856) RAILLIET AND HENRY, 1911 AND DIROFILARIA TENUIS CHANDLER, 1942.

(L. C. Card No. Mic 60-364)

Thomas Charles Orihel, Ph.D.
Tulane University, 1959

Chairman: Paul C. Beaver

With the increased recognition of the importance of the zoonotic species of filariae in relation to human disease, particularly those, like *Dirofilaria conjunctivae* that may produce non-patent filarial infection in man, there is need for the additional knowledge of morphological features which can be made use of in the recognition of filarial species at all stages of development.

Two common species of *Dirofilaria*, *D. immitis*, the dog heartworm and *D. tenuis*, a subcutaneous parasite of the raccoon were utilized in this study because they were readily available for study and represent the two natural subgroups of the genus.

The principal aims of the study were: (1) to describe in detail the morphology of the larval stages of these two species in the intermediate host, (2) to investigate the development of *D. immitis* in the definitive host and, (3) to describe the morphology of the adults of the two species in microscopic sections in an attempt to differentiate the species on histological characteristics.

A survey of 137 dogs from New Orleans, Louisiana, and vicinity, by examining concentrated samples of peripheral blood showed that 62.8% of the dogs had microfilariae in the blood. Two species were recognized. *Dirofilaria immitis* was found in 41.6% of the dogs and *Dipetalonema* sp. in 27.8%. A small percentage (6.6%) had infections with both species.

Infections with *Dirofilaria tenuis* were found in almost 70% of the raccoons collected in Louisiana. Such a high incidence of infection suggests a possible relationship between this species and *Dirofilaria conjunctivae* infection in man.

The larval development of both filariae was studied in the same species of mosquito, *Anopheles quadrimaculatus*. The development of the two species was found to be essentially the same and the various larval stages are morphologically almost indistinguishable. Attempts to infect fleas with *D. immitis* were unsuccessful.

The larval development of *D. immitis* in the definitive host was studied in experimentally infected dogs. Infective-stage larvae were inoculated into the subcutaneous tissues of young dogs which were then sacrificed at intervals from 5 days to 26 weeks. Larvae were observed to develop and molt twice in the subcutaneous tissues and musculature. The molts occurred at about 10 days (third molt) and 60-67 days (fourth molt), followed by migration to the heart. Worms were found in the heart as early as the 67th day. The adolescent worms were found to undergo further maturation in the heart, becoming sexually mature during the sixth month. At this time microfilariae are discharged into the blood stream, but may not be detected until the seventh or eighth month.

The sex of the larva is recognizable as early as the infective stage in the mosquito and becomes more evident thereafter.

The adults of *D. immitis* and *D. tenuis* can be differentiated in microscopic sections. The latter can be distinguished from *D. immitis* on the basis of conspicuous, longitudinal ridges in the cuticle, the relatively loose appearance of the protoplasmic portion of the musculature and the more regular arrangement and smaller number of hypodermal nuclei in the lateral chords. The length of the uteri and the portion of the body they occupy may also have some value in the differentiation of females of the species.

Microfilm \$2.50; Xerox \$6.80. 145 pages.

FACTORS AFFECTING THE HARVEST OF FISH IN THE DES MOINES RIVER, BOONE COUNTY, IOWA.

(L. C. Card No. Mic 60-590)

James Carter Schmulbach, Ph.D.

Iowa State University of Science and Technology, 1959

Supervisor: Kenneth D. Carlander

Creel-census studies on a 6.5-mile section of the Des Moines River were conducted in 1957 and 1958. Objectives of the study were to: (1) estimate angling pressure; (2) determine fishery characteristics; and (3) evaluate factors affecting the harvest of fish. Angler intensity was estimated with a modified Latin-square sampling scheme. Most of the 3,250 anglers interviewed were contacted while actively fishing.

No relationship could be demonstrated between rate of catch and either length of fishing trip or percentage of fishing trip completed up to time of the interview. Estimates of rate of catch from incompleting fishing trips were not statistically different from those obtained from completed trips. The amount of fishing pressure had no significant effect upon fishing success. Estimates of total fishing pressure and rate of catch were improved by defining seasons more precisely and sampling week-end days more heavily than weekdays.

Week-end days (especially Sundays) were fished more heavily than weekdays. During spring and fall the greatest amount of fishing pressure occurred in mid-afternoon but in summer, fishing intensity was highest in late-evening. During an average year the total amount of daylight fishing pressure may average between 10,000 and 13,077 man-hours per mile or 363 and 475 man-hours per acre. Night angling amounted to approximately 15% and 7% of the total summer and total annual fishing pressure respectively.

The mean catch per man-hour for all seasons was 0.38 fish. Boat fishermen enjoyed the best and waders the poorest catch per man-hour, 0.49 and 0.28 fish respectively. The combined catch of channel catfish and carp comprised between 73.0% and 88.5% of the total catch in numbers. Walleye were important to the total catch only in fall and suckers only in spring. An estimated 119.4 pounds of fish per acre (3,312 pounds per mile) were harvested in 1958. Carp comprised 51.8% of the total weight of the harvest.

Over 87% of the anglers contacted lived within a 20-mile radius of the point of interview. Men were more successful than women. Fishermen using one line were as efficient as those who used two.

Returns from tagged fish indicated the minimum annual rate of harvest of channel catfish as 4.6% and 9.3% for walleye.

Inclement weather during the spring and fall often caused anglers to stop fishing. The heaviest angling pressure in spring and fall coincided with warmest parts of the day.

Changes in water levels produced marked changes in the amount of fishing pressure but not necessarily the fishing success. The highest rate of catch occurred during the warmest period of the year and the lower rates of catch during the colder parts of the fishing year. Water temperature is a major spawning stimulus and channel and flat-head catfish and suckers were caught readily during their general spawning activity. Walleye were caught at a higher rate in the fall as a result of increased feeding activity. The best time to catch carp occurred at the time of highest recorded water temperatures. Harvest of carp and suckers is also controlled by angler preference, with higher rates of catch when there is poor fishing for other species. Rate of catch for bullheads was highest when water levels and turbidity were high.

Microfilm \$2.60; Xerox \$9.00. 200 pages.

COCCIDIOSIS OF MICE BELONGING TO THE HOST GENUS PEROMYSCUS

(L. C. Card No. Mic 60-274)

Bruce Walfred von Zellen, Ph.D.

Duke University, 1959

Supervisor: Wanda S. Hunter

A total of 536 trap nights covering a thirteen month period yielded the following animals: 5 *Blarina brevicauda* (Say), 4 *Mus musculus* Linnaeus, 4 *Peromyscus nuttalli* (Harlan), 56 *Peromyscus leucopus* (Rafinesque), and 17 *Sigmodon hispidus* Say and Ord. One *Rattus norvegicus* (Erxleben) and 2 *Sciurus carolinensis* Gmelin were also examined. At the time of examination *Blarina*, *Mus*, *Rattus*, and *Sigmodon* were negative for coccidia--the two gray squirrels showed a heavy infection of *E. sciurorum* Galli-Valerio.

Eimeria leucopi n. sp., and *E. carolinensis* n. sp., were described from *Peromyscus leucopus* and *E. chryse* was described from *P. nuttalli*. These hosts hitherto had not been known to harbor coccidial infections.

Minimum sporulation times, sporulation ranges, patent and prepatent periods were determined. The previous history of the host had no influence on the prepatent or patent period but a 3 day extension of the patent period of *E. leucopi* occurred after a heavy inoculation. Degenerate and non-sporulating batches of *E. leucopi* oocysts were observed. The degeneracy of oocysts was not related to the patent day or to the occurrence of a reinfection. A comparison of measurements indicated that different hosts on different days produced oocysts of essentially the same size. There was a tendency for oocysts to become larger with the passing of the patent day and the oocysts produced during the middle of the patent period had a wider range in length than those discharged at the beginning or end of the patent period.

A detailed study revealed notable differences between the sporogony of *E. leucopi* and *E. carolinensis*. Granular movement and extrusion, cytoplasmic pencil and canal formation, globular development, and geflamnte nuclei have been observed.

Excystation of oocysts was studied, and it was found that the sporozoites were liberated from sporocysts free of the oocyst. A posterior granule was not observed to explain the adhesive qualities of the sporozoite.

E. leucopi was found to be a parasite of the small intestine of the wood mouse. All phases of schizogony development were limited to the distal one-third of the intestinal villi. Generation I schizonts occurred in the upper and middle portion, with subsequent asexual stages developing throughout the small intestine. Gametogony was observed in only the lower one-third of the small intestine. Generation I schizonts were distinguished from generation II schizonts by the shape, size, and arrangement of the merozoites. Generation I schizonts were first observed at 36 hours; at 48 hours generation II schizonts were already present in the epithelial cells. Immature gametocytes were first observed at 96 hours. The presence of all size intergradations among generation II schizonts indicated no sexual dimorphism occurred among the schizonts and that gametocytes were the direct products of terminal merozoites. The absence of an apparent pathology and immunity were discussed.

The absence of *E. chryse* in *P. leucopus* and *E. leucopi* in *P. nuttalli* is due to a lack of susceptibility, and not to either a spatial or ecological isolation. Thirty-seven and seven-tenths per cent of the wood mice collected were infected with coccidia. Infections, found in all localities sampled, were of a light intensity. Animals collected in pine had a higher incidence of infection than those collected in hardwood. Reasons for the disparity of infection have been discussed.

Microfilm \$2.50; Xerox \$6.20. 127 pages.

STUDIES IN THE LIFE HISTORY OF *SPATHIDIUM SPATHULA* MÜLLER

(L. C. Card No. Mic 59-6954)

Donald Benjamin Williams, Ph.D.
Emory University, 1959

Phases of the life history of *Spathidium spathula* Müller, a predaceous soil ciliate, were studied. This organism was found in soil litter infusions made from samples taken from the Emory University campus. Laboratory cultures were established by transferring spathidia into infusions of bacterized lettuce (*Aerobacter aerogenes*) containing many *Colpidium colpidium* which served as prey for *Spathidium*.

A study of the morphology of vegetative animals revealed from 11-33 micronuclei, a long, twisted, single

macronucleus, 16 ciliary rows and numerous trichites in the ectoplasm.

Spathidium was able to consume *Colpidium colpidium*, *C. colpoda*, *C. striatum*, *Colpoda*, and *Stylonychia*, but was not able to injure or consume *Didinium nasutum*, *Paramecium aurelia*, *P. caudatum*, *P. busaria*, or *Tetrahymena pyriformis*.

Conjugation requires 16-20 hours for completion. The macronucleus uncoils and condenses during the first few hours. Around the fifth hour each partner divides once and approximately half of the macronucleus and half the micronuclei go to each fission product. Following fission the macronucleus divides into three or four short fragments which later condense and fuse together. At the same time the number of micronuclei is reduced. Exchange of micronuclei was never observed between conjugants. The macronucleus completely degenerates. The micronuclei divide and six macronuclear anlagen are formed in each partner probably from individual micronuclei. The anlagen then fuse together while the animals are paired or after separation. Exconjugants have six, four, three or two macronuclear anlagen, and 7-12 micronuclei.

Encystment occurs after conjugation if no food is present. Before encysting, animals are hyaline and spherical. The mature cyst has three cyst membranes, a hard, brown and spiny ectocyst; a clear mesocyst; and a delicate intimocyst immediately around the animal. Very early cysts (0-5 hours) have 7-12 micronuclei and a long coiled macronucleus. The macronucleus condenses into a horseshoe shaped structure and 20-35 micronuclei are present by the end of the fourth day. The macronucleus remains unchanged during the encysted state.

Activation of wet and dry cysts less than eight days old, formed on a glass substrate, was induced by addition of distilled water; tap water; sterile and bacterized lettuce, *Cerophyl* and pine needle infusions. Cysts three to four weeks old showed a decreased viability when exposed to the same conditions. Cysts formed on sterile pine needles maintained their viability for more than 14 months.

Bacteria-free *Spathidium* was cultured in salt solutions, plant infusions and nutrient media along with numerous prey. Only lettuce infusion supplies factors necessary for continued growth. An average of 2.7 daily divisions occurred when ten of these predators were cultured in 2.5 ml of sterile lettuce infusion containing 40,000 prey.

A 20% dilution with lettuce infusion of a nutrient "X" medium consisting of 1% Proteose-peptone, 0.5% yeast autolysate and 0.5% glucose supports growth of *Spathidium* and the prey, *Colpidium colpidium*. This was used for the population interaction study. In 25 ml of sterile medium the initial predator population of 20 animals per ml increased to 187 per ml within three days and eliminated the prey (2500 per ml initially) by that time. The predator population then declined slowly for seven days. By the eleventh day all predators were dead. During the period of population decline the predators decreased about 60% in length and width.

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